McGRAW-HILL PUBLICATION

FACTORY

MANAGEMENT AND MAINTENANCE

JANUARY 1951

TECHNOLOGY DEPT.

WHAT YOU NEED TO KNOW FROM WASHINGTON

SPECIAL INSERT FOLLOWING PAGE 64

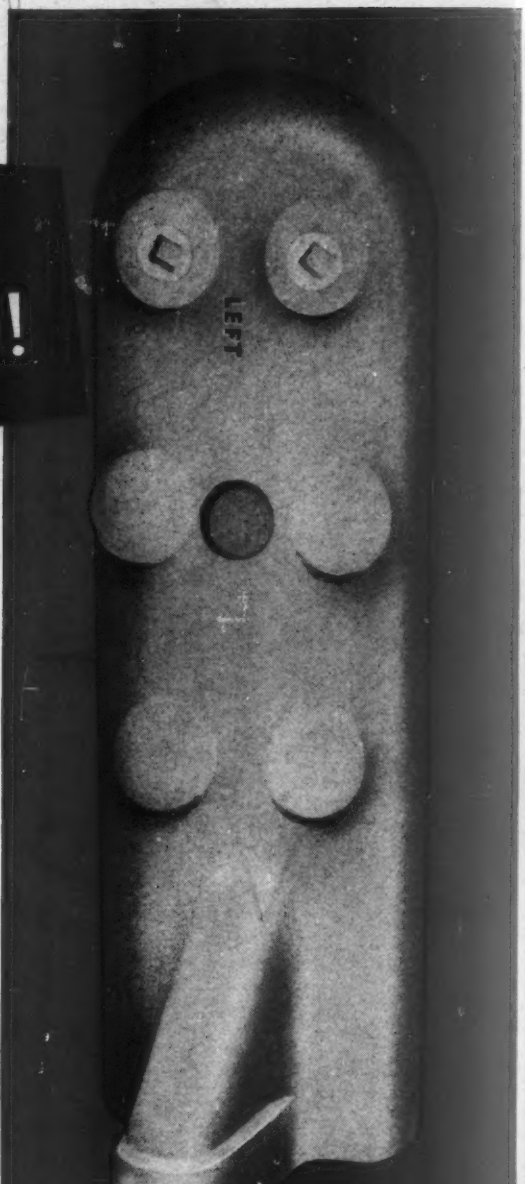
plus { HOW TO GET YOUR MAINTENANCE MONEY'S WORTH

A 40-PAGE REPORT ▸ PAGE 61

COMPLETE CONTENTS ▸ PAGE 2

R v. 109 Jan. – Apr. 1951

THIS CASTING SAVED $12,000.00!



Why an Electrode Holder, redesigned by National Bearing Division, lasted over 73 times longer

A large Midwest plant was getting 5 days service from furnace electrode holders . . . before a trial order was placed with National Bearing Division. This plant saved dollars—*right from the start.* A special copper alloy permitted sound, dense castings at no sacrifice in electrical conductivity. Result? *30 days service—instead of 5—before replacement.*

On the next order, National Bearing Division engineers submitted a new design for the clamp—for greater strength and resistance to cracking. The redesigned electrode holders are still in use—after a year of trouble-free operation! They've saved $12,000.00 on replacement costs and furnace maintenance.

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Tech

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Where failures meant shutdowns they changed to grommet V belts

B. F. Goodrich grommet V belts cut costs 20 to 50%

THESE V belts operate in heavy-duty service 8 hours a day, 5 days a week. When the drive stops, the whole operation shuts down. It costs more to stop than keep going! Previous V belts suffered from shock loads, wore out fast. A BFG man recommended the grommet V belt to stand the jerks and hard pulls. The grommet V belts shown here have been in service 2 years, with no shut-offs or shut-downs for maintenance. Here's why the grommet V belt lasts 20 to 50% longer:

No cord ends—A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

Concentrated cord strength—All of the cord material in a B. F. Goodrich grommet multiple-V belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced.

Better grip, less slip—Because a grommet is endless, a grommet V belt is more flexible, grips the pulleys better. Size for size, grommet multiple-V belts will give ⅓ more gripping power, pull heavier loads with a higher safety factor.

Only B. F. Goodrich has the grommet!—No other multiple-V belt is a grommet V belt (U. S. Patent No. 2,233,294). At present made in C, D and E sections only. See your local B. F. Goodrich distributor. Ask him to show you his "X-ray" belt that illustrates grommet construction clearly. *The B. F. Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

Grommet V Belts BY

B.F.Goodrich

RUBBER FOR INDUSTRY

BEHIND THE BYLINE

THIS MONTH, FACTORY publishes a 40-page special section on the management of maintenance.

Before top management and maintenance executives can team up to do the best possible maintenance job, two things are necessary: They must fully understand each other's objectives. And they must agree on how much money is needed to reach those objectives. FACTORY's special section aims to promote that understanding and cooperation.

We asked management executives to tell us what they expect of maintenance. Then we got maintenance executives to describe how they would set up their maintenance programs if given a free hand. You'll find these articles on pages 81-103. Photos and titles of authors appear with their articles.

Finally, we went into plants where management - maintenance teams are operating successfully. The case studies beginning on page 104 describe systems they use to control maintenance costs. Here are facts about five of the authors:

The world's brightest lights were recently built in Cleveland under the supervision of **I. M. DINGER,** manager of manufacturing for Westinghouse's Lighting Division. The lights bring in airplanes when visibility is zero. Dinger has shed a lot of light on maintenance controls, too. His knowhow comes from 32 years with Westinghouse.

An unusual achievement marks the career of **HENRY M. BRADLEY,** plant engineer at the Bridgeport plant of Manning, Maxwell & Moore, Inc. He once held three union cards at the same time — as master carpenter, machinist, and pattern maker. That experience made him a firm believer in "doing the job right or not at all," a conviction he has carried over into his present position. Bradley is also safety director and division head of the pattern shop.

When a man combines optimism with hard work, he's sure to go places. A case in point is **H. W. ZIMMER.** Now executive vice president of Sylvania Electric Products, he started out 30 years ago as an assistant in the purchasing department. Says Zimmer, "Work is the only 'hobby' I have." He does like to fish. But he'd rather talk about his work than "the one that got away."

FACTORY

MANAGEMENT and MAINTENANCE

The Magazine of Plant Management for 59 Years

JANUARY, 1951

SPECIAL REPORTS

Get Ready Now for a New CMP ..... BY CARROLL W. BOYCE 68

A Controlled Materials Plan, that is. Here's a refresher on how it worked last time, with a good guess as to how it will operate this time.

How to Get Your Maintenance Money's Worth 81

What management wants, what plant engineers prescribe, how six plants really get it. A 40-page section. For contents, see MAINTENANCE.

What You Can Do Now to Keep Workers on the Job .. BY M. J. MURPHY 130

Third of FACTORY's checklists on ways to tackle the manpower problem. First two—recruiting and training—in the December, 1950, issue.

PRODUCTION

New Layout Means Less Walking, Less Handling, More Output, Lower Costs ..... BY EDWARD ZAKAR 72

Those are the benefits Kayser gets. They're typical of the benefits a company gets when it goes after its methods.

We Pick Up a Phone—to Get Real Control of Operations BY G. E. HERRE 78

Plant men at Tuttle & Bailey use their new in-plant telephone system to get information to—and from— the right people fast.

CAMERA TOUR: American Welding & Manufacturing Company 124

Selling Safety Down the Line—for a New World's Record

Your chance to hitch hike—and learn how they did it.

MAINTENANCE

How to Get Your Maintenance Money's Worth 81

Always one of our biggest problems. Today more important than ever.

What Management Expects for Its Maintenance Dollar 82

Fourteen executives tell all in answer to our question: "Is maintenance doing a job in your plant? How do you know?"

WAYNE CARROLL knows plenty about costs. He's payroll supervisor at Fairchild Aircraft. Even more important, he's budget control analyst. In that position, he's the middleman between management and maintenance who makes sure that maintenance gets all the dollars it needs—and no more. Carroll holds a Bachelor of Commercial Science degree from Hagerstown Business College. During World War II, he was an electronic specialist with the U. S. Air Force. He came to Fairchild in 1941, has performed various staff accounting functions since that time.

RICHARD C. WEEKS first applied his analytical urge in Kellogg Company's production research department 14 years ago. In 1941 he transferred to engineering, and he's now plant engineer. Weeks holds a B.S. degree in metallurgical engineering. During the last war, he helped pilot the Navy's radar and navigational aids section. He belongs to the Battle Creek Engineering Society and National Association of Foremen.

On the opposite page are brief sketches of two other authors whose articles appear in this issue.

What Plant Engineers Prescribe to Get Good Maintenance 90

We asked ten men what they'd do if they had a perpetual green light. Here, to help you plan your own program, are their answers.

How Six Plants Control Their Maintenance Costs

Westinghouse Electric Corporation ..... BY I. M. DINGER 104
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The Cleveland Graphite Bronze Company BY WILLIAM G. LAFFER 118

INDUSTRIAL RELATIONS

Job Instruction Training: One Answer to the Green-Worker Problem 120
BY M. J. MURPHY

Remember JIT and the other "J" programs of World War II? They're still going strong, will go even stronger as manpower gets scarcer.

On- and Off-the-Job Training Makes Mechanics From Scratch 122

How Boeing works with local schools to beat the manpower shortage. A simple program within the reach of any plant, large or small.

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The Labor Relations Picture—Seen From Both Sides..... 240

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EDITORIAL

"If they'd only ask the maintenance department!" 67

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When **EDWARD ZAKAR** entered Julius Kayser & Company's methods department in 1947, he soon proved that his methods experience in the sheetmetal field (a year with Cole Steel Equipment Company) could be applied to underwear manufacturing. Says he, "I never used to have enough courage to buy a slip or pair of panties, much less work with them. Nowadays, my wife often finds a fancy lacy number dangling from my pocket when I get home." On page 72, Ed tells about the layout and handling techniques used at Kayser's new Sterling plant in Bangor, Pa.

"Up to a couple of years ago, our communications setup was inadequate," says **G. E. HERRE**, production manager of Tuttle & Bailey, Inc., New Britain, Conn. "I was probably the loudest complainer, so I got the job of finding something better. Along with two other executives, I checked on many new communication methods. We aimed at perfection, and we think we've come close to it with our present setup." On page 78 is his story of how it works. Everett Herre came to Tuttle & Bailey in 1926, went from payroll to cost accounting to purchasing to production.

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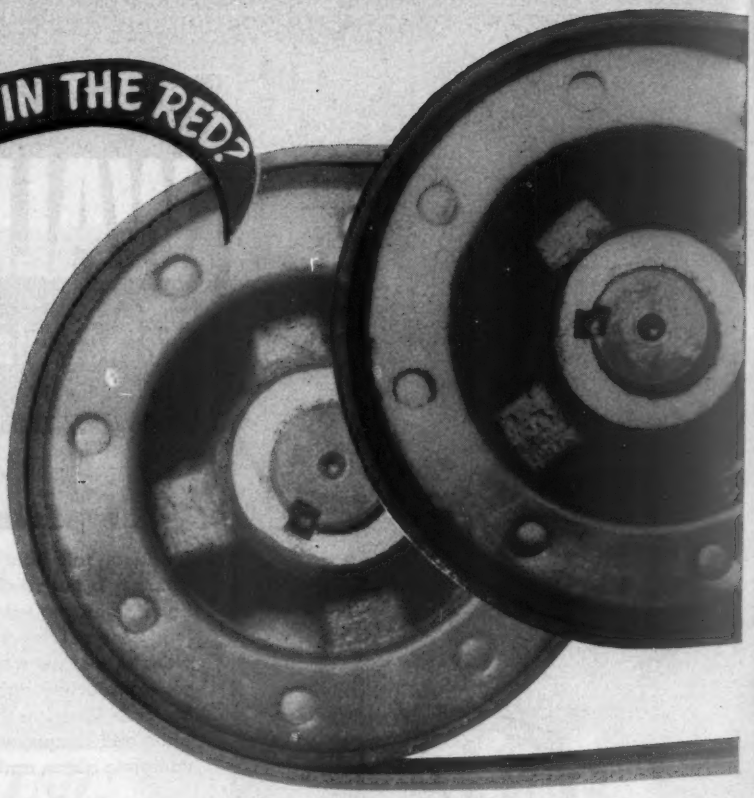

These high-speed photographs stop the action of this 6" crowned pulley at 600 RPM. The *black* photo shows a G&K RESEARCH 2-ply leather belt. *Note that the edge of the belt is snug with the face of the pulley, proving full surface contact.*

The *red* photo, taken under identical conditions with a standard 2-ply oak tanned belt, *shows the edge of the belt away from the face of the pulley, proving that this belt is riding the crown.*

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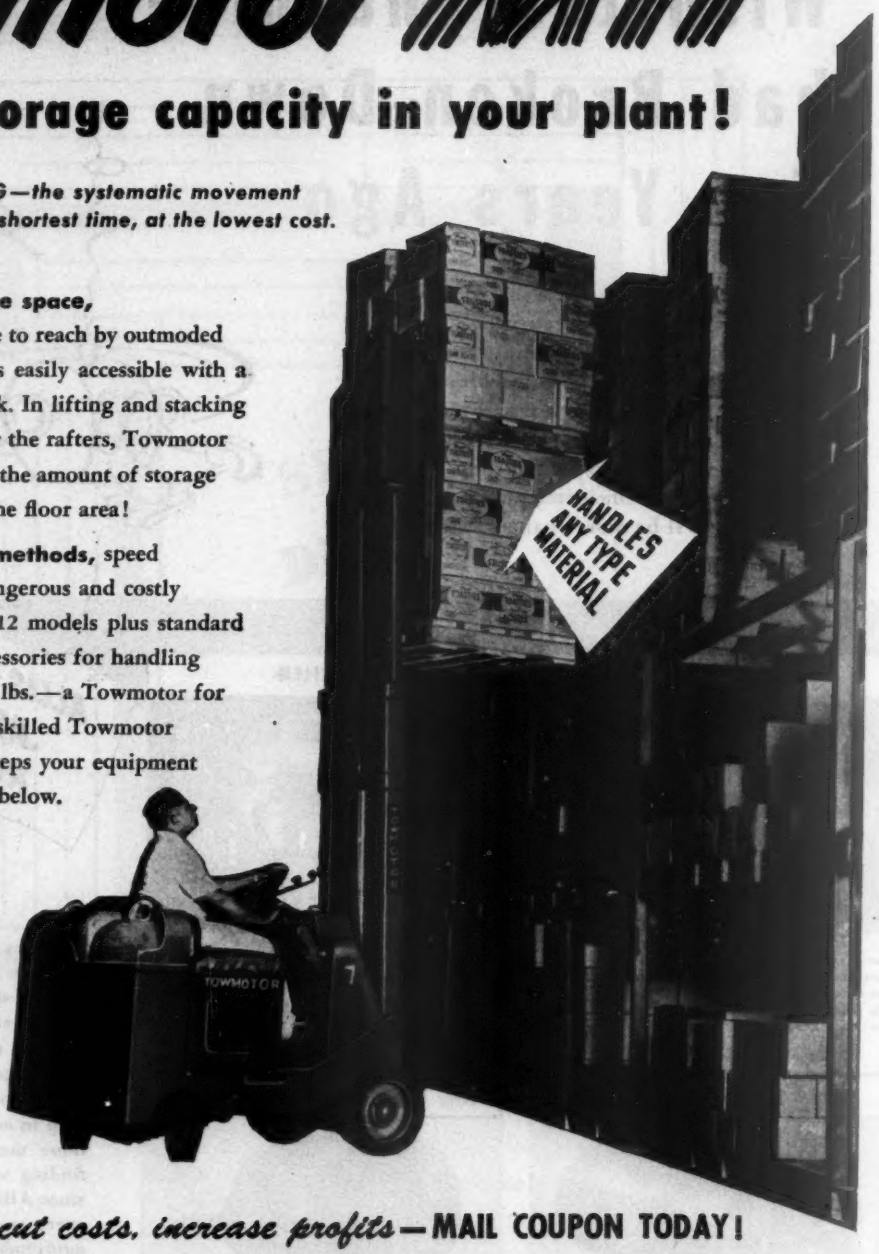

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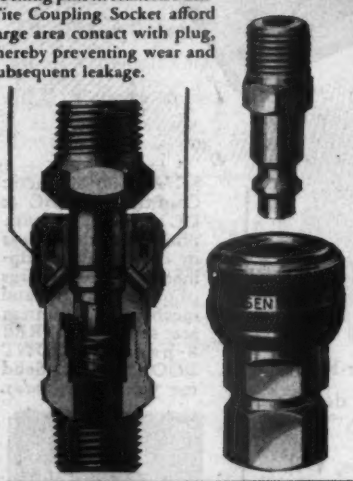

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IF YOU SAY:

"*But my loads are different*"

then look at these

ELWELL-PARKER *Specials*

These examples illustrate ingenuity in solving unusual handling problems. To meet such needs, Elwell-Parker draws on its 45 years' experience supplying power trucks for over 300 industries. That is why owners of mixed fleets usually turn to Elwell-Parker when they have special requirements . . . From its "pool" of 87 different sizes and types, Elwell-Parker can usually select a truck for the job. If not, ask your man about a unit "tailored" precisely to your needs. The Elwell-Parker Electric Company, 4020 St. Clair Avenue, Cleveland 3, Ohio.

FREE BULLETIN on Scientific Materials Handling. Write for "Industrial Logistics" and name your product.

ELWELL-PARKER

POWER INDUSTRIAL TRUCKS

Established 1893

Roll Clamp

Special Crane

Drum Handler

Die Handler

Pallet Retriever

Upender

Cable Reel Handler

Side Dump Revolving Unit

Roll Handler with Apron

Tin Plate Clamp

Bale Clamp

Twin Coil Handler

Rotary Scoop

Roll Piercing Truck

3-Ton Low Lift; 1-Ton Crane

AN ALIBI WON'T BRING BACK MONEY WASTED MACHINING IMPERFECT CASTINGS!

So put your confidence in radiography . . . one of management's surest instruments for cutting cost!

An outstanding example of the contribution of radiography to production processes is revealed by an automobile manufacturer. By pointing the way to improved foundry techniques — radiography is credited with saving this company in excess of a quarter million dollars a year in one part alone.

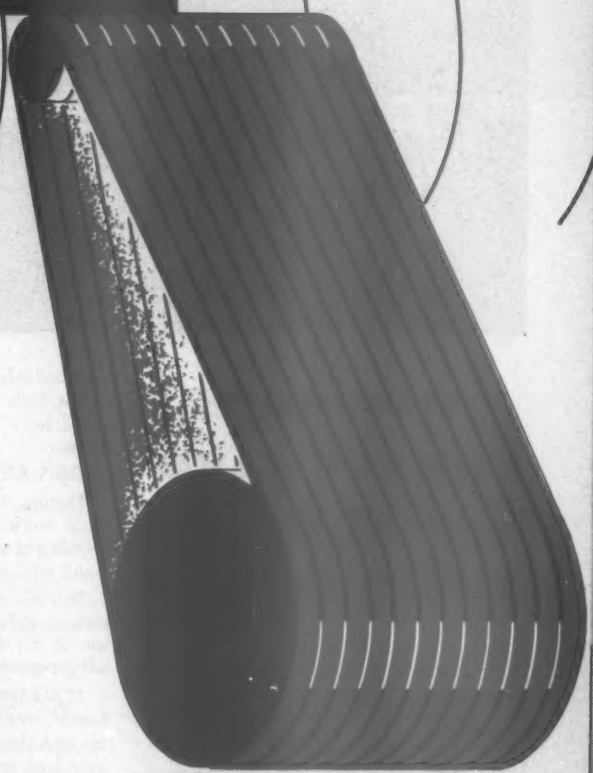
Another story of savings and profit made possible through the magic of radiography. A double-edge tool that not only diagnoses accurately and authoritatively — but suggests treatment as well.

Radiography shows where savings can be made, designs improved, new techniques developed. Write for interesting, informative booklet, "Radiography as a Foundry Tool." General Electric X-Ray Corporation, Dept. AC-1, Milwaukee 14, Wisconsin.

GENERAL ELECTRIC X-RAY CORPORATION

SMOOTH running

Condor V-BELTS



"Smoothest running V-Belts we've ever had," users say. "... and they smooth out our production problems, too!"

Smooth running is no accident in Condor Whipcord V-Belts. For example, we micro-position the pulling section so that it stays in the neutral axis area, where engineering practice says it should be. With every belt so precision-made, a Condor Multiple V-Belt drive is bound to be a smooth running team.

Bulletin 6868 D, mailed on request, describes all advantages to you of Condor Whipcord V-Belts.

You'll find this same good engineering also in our hose, flat belting and conveyor belts. Just phone your R/M Distributor.

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

HOW DID SUNSET BLVD GET ON BROADWAY?

Everyone knows that it's hard to be in two places at the same time.

But recently, Paramount Pictures had to be in 387 places at once.

The release of their smash hit, "Sunset Boulevard," called for *simultaneous* openings in theatres on Broadways all over America. And although Gloria Swanson is being mentioned for an Oscar, Paramount feels there ought to be a special award for a star not even mentioned in the cast.

That's Air Express!

Thanks to Air Express, Paramount could work on the cutting, editing and printing of this film up to the last minute —and still get there on time!

But, you don't have to be in the motion picture industry to profit from regular use of Air Express. Here are its unique advantages which any business can enjoy:

IT'S FASTEST — Air Express gives the fastest, most complete door-to-door pick up and delivery service in all cities and principal towns, *at no extra cost.*

IT'S MORE CONVENIENT — One call to Air Express Division, Railway Express Agency, does it all.

IT'S DEPENDABLE — Air Express provides one-carrier responsibility all the way and gets a *receipt upon delivery.*

IT'S PROFITABLE—Air Express expands profit-making opportunities in distribution and merchandising.

Like to know more? Call your local Air Express division of Railway Express Agency.

AIR EXPRESS
GETS THERE FIRST

BRING OUT **BUILT-IN PERFORMANCE** OF MOTORS AND MACHINERY

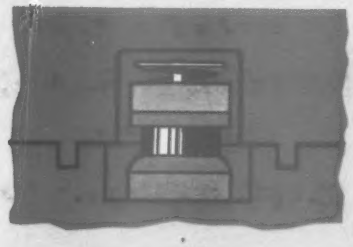
Applied to the B. M. Root Company combination multiple sawing and wood boring machine Style CXH, Arrow-Hart Type "RA" Magnetic Starters, in conjunction with the A-H Push-Pull-Selector and Type N Disconnect Switches, afford simplified and dependable control in a minimum of operating space. The same combination of A-H Type "RA" starters with the A-H Disconnect Switch permits a small, unusually compact panel layout.

NEW TYPE "RA" ARROW AH HART MAGNETIC STARTERS

JUST 1/2 THE SPACE *PLUS* FULL PROTECTION

HIGH ARC RESISTANCE

Arrow-Hart "RA" Magnetic Starters and Contactors feature a new thermosetting molding compound in the base and hood. This alkyd, with an extremely high resistance to tracking, exceeds the arc resistance of the next best material by more than 50%. It does not support combustion. The tongue and groove design pictured at right provides individual arcing chambers around each contact. This full protection is only one of the many features that add up to outstanding performance in Arrow-Hart "RA" Magnetic Starters. For more of the story, see next page.



AVAILABLE IN A FULL LINE -- Sizes 0, 1, 2, 3, and 4.

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN., U. S. A.

ARROW AH HART

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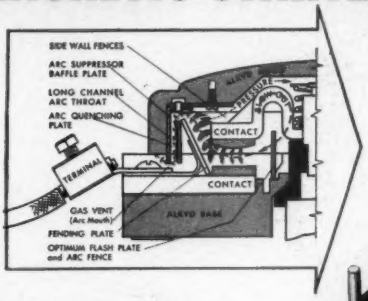
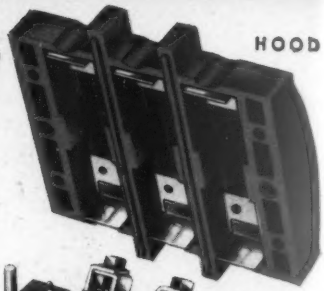
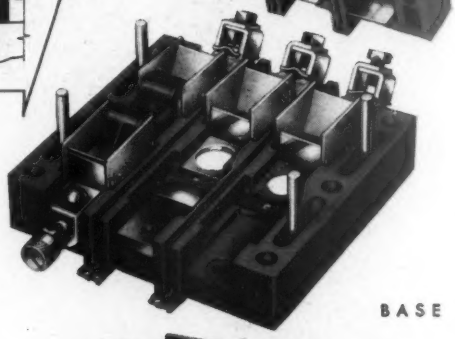
TYPE "RA" MAGNETIC STARTERS

MAXIMUM SAFETY



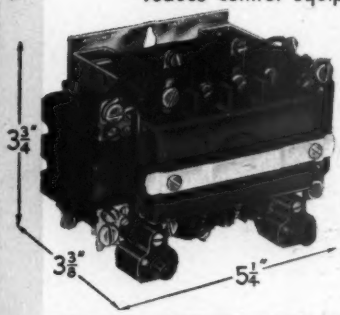
All A-H Magnetic Starters and Contactors are designed for maximum safety. The view at right shows how special protection is provided for the Size 4 (50 to 100 H.P.). This unit is designed so that the arc follows a controlled path, across and between the quenching and baffle plates. High heat-proof chutes enclose each contact. Contacts are shaped to produce a magnetic "blow-out" field within the arc fence. This field forces the arc in the correct direction for extinction.



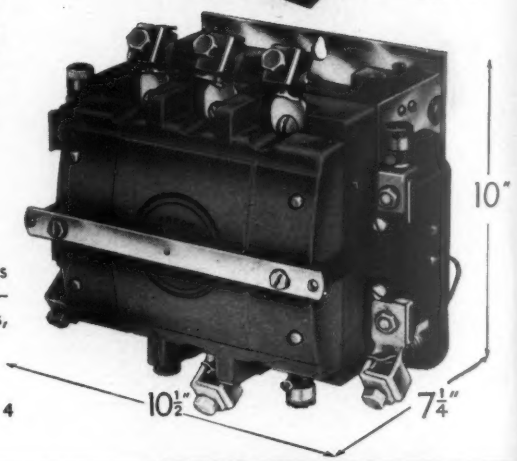


MORE FEATURES--IN ½ THE SPACE

In A-H starters and contactors an exclusive new "RA" balanced mechanism multiplies leverage and increases contact pressure. It is this same mechanism that accounts for the revolutionary small size of Arrow-Hart starters. Other features are: guided parallel closures to insure contact alignment; new, bigger contacts; improved magnet and coil; plenty of wiring room; and many others. Most important of all — designers save valuable control space, reduce control equipment cavities, and cut material costs.



SIZE 0

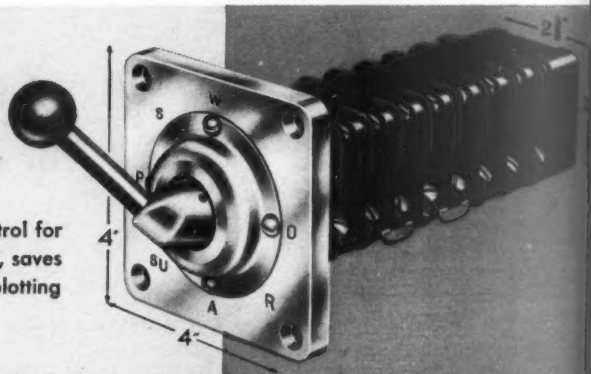


SIZE 4

A STARTER FOR EVERY REQUIREMENT

Arrow-Hart Type "RA" Magnetic Starters and Contactors are available in a full line — Sizes 0, 1, 2, 3, and 4. For full particulars, write for Form G-7005.

New PUSH-PULL SELECTOR SWITCH



The new Arrow-Hart PPS Switch provides a single point of control for multiple-operation machines — eliminates gangs of push buttons, saves time, money, and space. Target sheets available to aid in plotting your requirements.

WRITE TODAY FOR LITERATURE AND SPECIFICATION SHEETS

ARROW·HART

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
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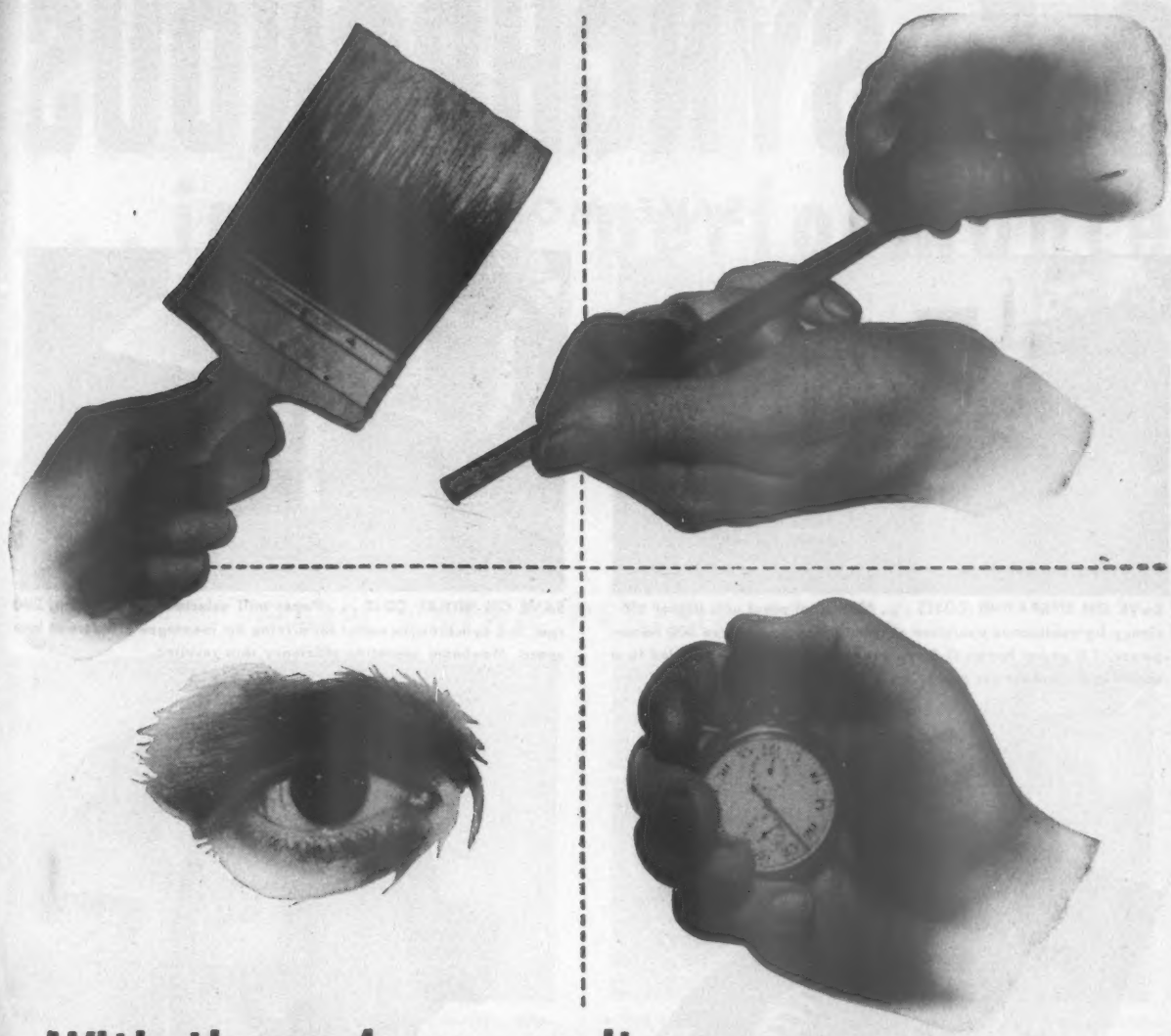


With these 4 you can't go wrong

in figuring your painting costs

Funny how so many people think that the price per gallon is the key to lower painting costs, when the *real* factors in low-cost painting are the brush, the tape, the eye and the clock.

Sure, paints differ in price . . . and Barreled Sunlight costs as much if not more than any of them. But if you compare a gallon of Barreled Sunlight with any other paint . . . (1) by the amount you have "ready for the brush" after thinning; (2) by the yardage you get per gallon; (3) by the bright, clean, thorough coverage you get with one coat; and (4) with the great savings in labor you realize through faster application . . . there will be no question in your mind that for a high-quality, long-lasting paint job Barreled Sunlight will *always cost less.*

Go into your paint cost problems thoroughly. Our representative will gladly show you how much more for your dollar you will get with Barreled Sunlight. Write and he'll call.

U. S. GUTTA PERCHA PAINT COMPANY, 2-A Dudley St., Providence, Rhode Island

Barreled Sunlight *Paints*

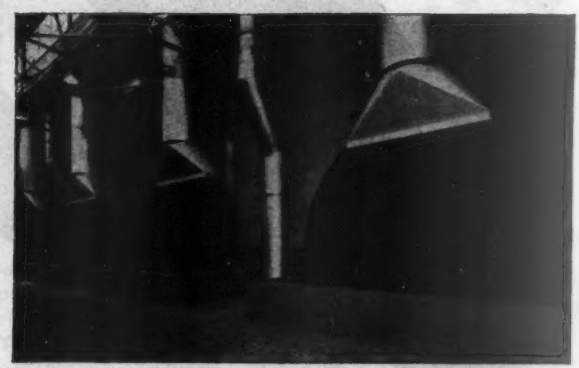
In whitest white or clean, pleasing colors, there's a Barreled Sunlight Paint for every job

It always costs more not to paint!

G-E SYNCHRONOUS

SAVE MONEY

SAVE ON OPERATING COSTS . . . Municipal plant gets higher efficiency by continuous operation at constant speed of three 500 horsepower, 1.0 power factor, G-E synchronous motors, each coupled to a centrifugal storm-sewer pump.



SAVE ON INITIAL COST . . . Paper mill selected this 4000 hp, 200 rpm, G-E synchronous motor for driving the montague grinders at low speed. Maximum operating efficiency thus resulted.

MOTORS CUT COSTS ...improve performance

IT'S ON THE RECORD...

Lower operating costs higher operating efficiency

Lower initial cost including control and exciter—for many ratings

Reduced demand and release of needed generating capacity

Reduced power rates for improved power factor

For your next large, constant-speed motor, ask your General Electric sales representative to tell you how you can take full advantage of the money-saving features of G-E SYNCHRONOUS MOTORS. Or write for bulletins GEA-5332 (low-speed) or GEA-5426 (high-speed) on your letterhead to *Section 770-22, Apparatus Department, General Electric Company, Schenectady 5, New York.*

GAIN EXTRA PERFORMANCE

DEPENDABILITY . . . Extra protection against physical damage, electrical breakdown, and operating wear and tear makes Tri-Clad® motors highly suitable for sawmill operations. Here is a Tri-Clad synchronous motor rated 300 hp, 1200 rpm, driving an edger in an Oregon sawmill.

LONG LIFE . . . All welded steel-plate stators assure a permanently solid core, and box-type construction means a rigid frame. This 350 hp, 0.8 p.f. G-E synchronous motor, coupled through magnetic clutch, is matched to a fan pump which delivers stock to paper machine.

SIMPLIFY OPERATING PROBLEMS

APPLICATION ENGINEERING . . . Engineers with many years of field experience will tailor synchronous motors to fit your needs. An example is this largest synchronous motor (in horsepower) ever to be applied to drive a reciprocating compressor; G-E motor rated 4500 hp, 300 rpm, driving a Clark gas compressor.

®Reg. U. S. Pat. Off.

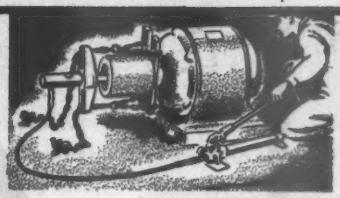
SERVICE . . . No matter where your plant is located, you will find General Electric service close at hand. Experienced engineers of our local offices, and trained staffs from our Service Shops are always at your command.

Man-Alive! this Hydraulic Jack

DOES EVERYTHING

but walk and talk!

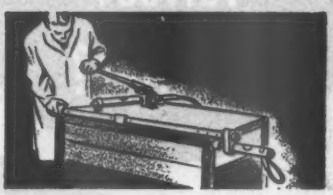
It's a "Porto-Power" Jack! It's remotely controlled . . . it's all directional . . . and it can do "1001" tough jobs. You'll be positively amazed at the time, trouble and money it saves!

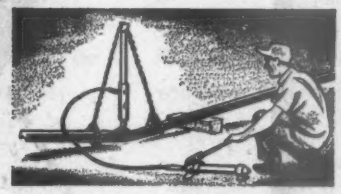


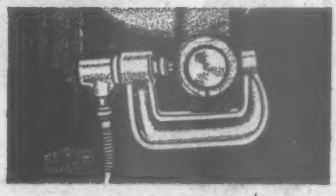
LIFT Lift from a low of 1½". Save up to 9 hours or more in moving and re-settling a machine with this "Porto-Power" toe-lift setup.

PULL Standard attachments quickly harness the ram to pull with FULL power. Pull wheels, gears, pulleys — no prying or sledging.

PRESS Mount the "Porto-Power" ram in a home-made press or a standard "Porto-Power" bench press. Ram is easily removed.







CLAMP Clamp parts for welding, riveting or other operations. Combinations build up for short or long spans.

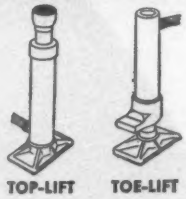
BEND Bend monorail, straighten shafts — apply hydraulic power how, where and when you want it!

PUSH Push out pins, bushings, etc., with this or other versatile "Porto-Power" combinations.

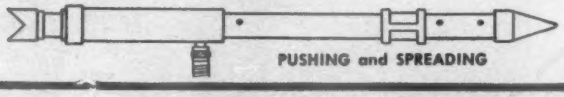
Here are just a few of the many "Porto-Power" COMBINATIONS

Standard attachments and the ram are threaded for easy, fast assembly.

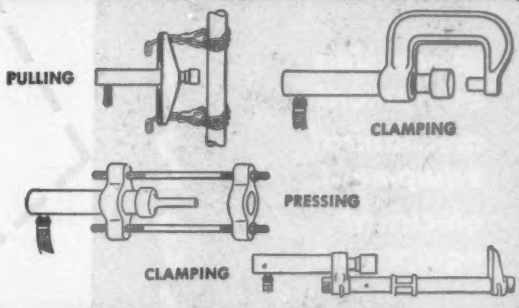
A sturdy high-pressure safety hose connects the ram to the portable hydraulic pump.



TOP-LIFT TOE-LIFT



PUSHING and SPREADING



PULLING CLAMPING PRESSING CLAMPING

"Porto-Power" eliminates all this . . . conserves valuable manpower!

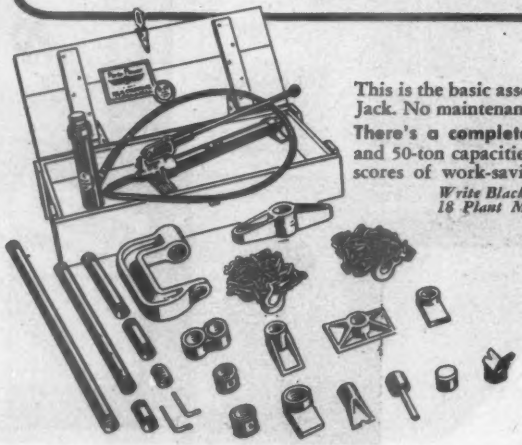
OUT goes dangerous blocking up.

OUT go inconvenient, time-taking operations.

OUT goes damaging hammering and prying.

OUT goes excessive use of heat.

OUT go costly and varied mechanical devices.



Every plant needs the S31 KIT

This is the basic assortment of "Porto-Power" attachments and the 10-ton "Porto-Power" Hydraulic Jack. No maintenance crew can afford to be without it! It pays for itself on one or a few good jobs.

There's a complete line of "Porto-Power" equipment! Rams are available in 2, 4, 7, 10, 20 and 50-ton capacities and a range of sizes . . . with hand-operated or motor-driven pumps . . . plus scores of work-saving attachments for maintenance, production or laboratory work.

Write Blackhawk or see your industrial supply dealer. (Visit Blackhawk's booth No. 506 at the Jan. 15-18 Plant Maintenance Show, Cleveland). Blackhawk Mfg. Co., Dept. J-2711, Milwaukee 1, Wis.

Porto-Power

is the exclusive (trade name registered) product of

BLACKHAWK

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S

process industries

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1951

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reach for Sweet's **... All these manufacturers' catalogs — containing comprehensive information on pipe and fittings, valves and traps, measuring and controlling equipment — are instantly available in Sections 2d, e and f of your Sweet's File for the Process Industries.**

The other sections of this Sweet's File contain additional catalogs covering a wide range of materials and equipment ... useful and up-to-date information on product forms, characteristics, performance and use.

This grouping of manufacturers' catalogs, in sections according to products or use of products, is made for your convenience, so that you can more readily compare one product with another. Indexes of manufacturers, products and trade names lead you quickly and easily to the catalogs you are looking for.

Sweet's is working constantly to get more manufacturers to send you their catalogs in this easy-to-use form. If you fail to find what you want, please tell us.

Sweet's catalog service

DIVISION OF
F. W. DODGE CORPORATION
119 WEST 40th STREET
NEW YORK 18, N. Y.

The NEW Brown & Sharpe MICROMETERS

- Black graduations
- Dull chrome finish
- Wide divisions
- Hardened and ground threads
- New sliding taper thread adjustment
- Positively locked screw and thimble
- Quick, easy thimble adjustment
- Rust resistant
- Available in complete range of sizes

Cutaway view shows exclusive Brown & Sharpe adjustments—simple, positive, accurate.

Large diameter thimble provides wide divisions. Easy-reading black graduations and figures on rust-resistant dull chrome finish.

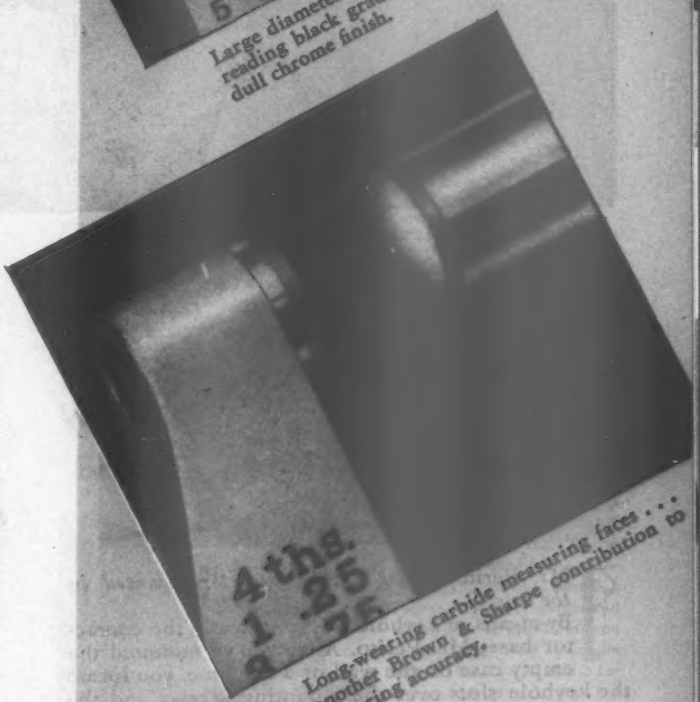
An exclusive combination of advanced features!

Never before has a line of micrometers offered such an outstanding combination of advanced features! Improvements throughout the new Brown & Sharpe Micrometers now contribute higher performance to every essential of micrometer service . . . readability, accuracy, ease of adjustment, durability.

Notice the widely-spaced divisions, black graduations and dull chrome finish . . . for easy, accurate reading. Observe the integral spindle and screw with simplified thread adjustment and longitudinal adjustment of thimble on screw. Consider what the long-wearing carbide faces and one-piece stainless steel spindle and screw with hardened and ground threads mean to durability!

Only by actually seeing and holding one of these new micrometers in your own hand can you appreciate all the advantages of these many new features. See them at your hardware store or tool supplier's. Write for illustrated folder describing the completely new line of Brown & Sharpe Micrometers. Brown & Sharpe Mfg. Co., Providence 1, R.I., U.S.A.

We urge buying through the Distributor



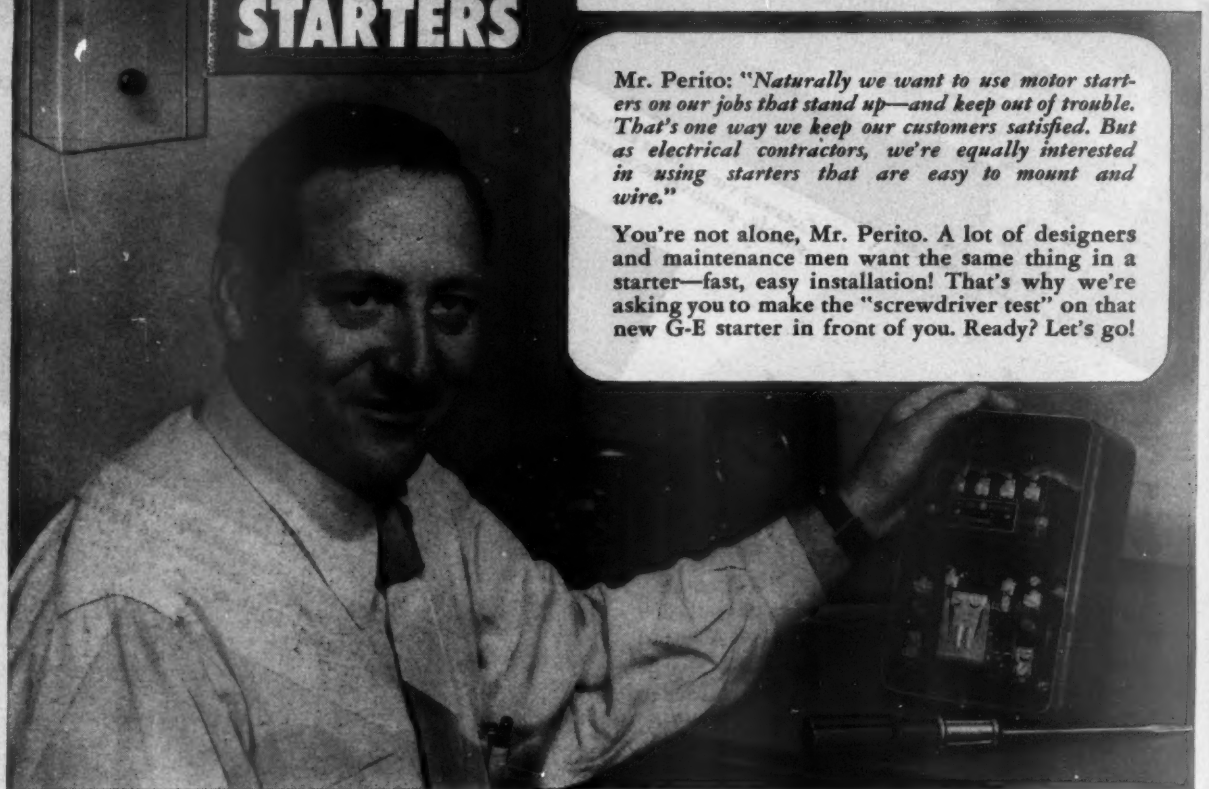
Long-wearing carbide measuring faces . . . another Brown & Sharpe contribution to enduring accuracy.

Brown & Sharpe

B·S

MOTOR STARTERS ... easier to

T.G. PERITO, ELECTRICAL CONTRACTOR, LEARNS



Mr. Perito: "*Naturally we want to use motor starters on our jobs that stand up—and keep out of trouble. That's one way we keep our customers satisfied. But as electrical contractors, we're equally interested in using starters that are easy to mount and wire.*"

You're not alone, Mr. Perito. A lot of designers and maintenance men want the same thing in a starter—fast, easy installation! That's why we're asking you to make the "screwdriver test" on that new G-E starter in front of you. Ready? Let's go!

1 Mr. Perito: "*How is this contactor mounted in the case?*"
By means of keyhole slots you see in the contactor base, Mr. Perito. After you've mounted the empty case on the wall or a machine, you locate the keyhole slots over the mounting screws and the contactor slips into place!

2 Mr. Perito: "*Lots of knockouts, I see!*"
You'll find these on every side of the case—more than enough to give you faster, neater installations. Plenty of room on the inside, too, and notice how the light grey finish on the inside gives you plenty of reflected light!

GENERAL ELECTRIC

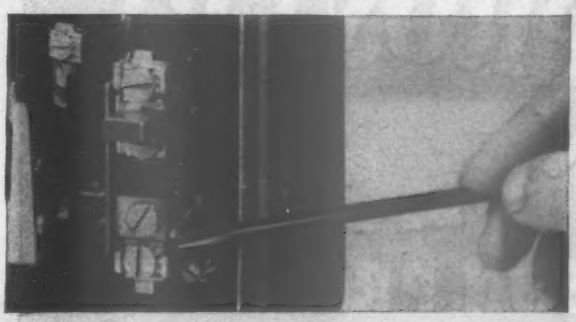
730-18

install for these 6 reasons

ABOUT THESE IMPORTANT FEATURES WITH THE "SCREWDRIVER TEST"

3 Mr. Perito: "*Are all the terminals easy to get at?*" Every one of them is *up front* where it's easy to get at, and wire. And they're *big* terminals with panhead screws and saddle-type connectors that ride up with the screw head. The stripped wire simply slides into place and is easily secured with a turn of your screwdriver.

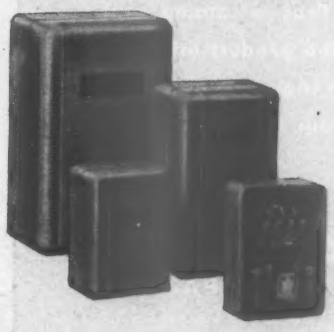
4 Mr. Perito: "*Tough-looking coil! Is it new?*" Right! It's called the "Strongbox Magnet Coil" and it's an exclusive with the new G-E starter line. Feel how solid it is! If your electrician's screwdriver slips, it can't hurt the windings—they're safely locked in a block of molded plastic. And oil, dust or water can't get at them, either!



5 Mr. Perito: "*How do I set the overloads?*" Easy—and you don't have to take the starter apart to do it. Flip that little lever and it's on "Automatic." Flip it back and it's on "Manual." Heaters are in the front, can be changed without disturbing any wiring.

6 Mr. Perito: "*What about maintenance?*" Once this new G-E starter is installed, it *stays* installed. There's no need to remove the case for ordinary maintenance or even to replace or reverse contacts. Just remove the arc chute and there are your terminals.

WHY DON'T *YOU* "BUY ONE AND COMPARE?"



See for yourself why this new line of G-E motor starters lasts longer, costs less to install than almost any other starter you can buy. Your G-E representative or authorized G-E agent or distributor can supply you from stock in NEMA sizes 0, 1, 2 and 3 for a-c motors up to 50 hp. For a complete description, write for Bulletin GEA-5153. *Section 730-18, Apparatus Dept., General Electric Company, Schenectady 5, New York.*

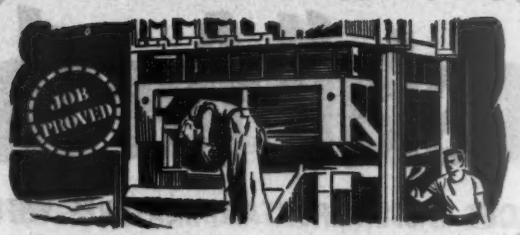
JOB PROVED

SUN PRODUCTS OFFER YOU "JOB PROVED" PERFORMANCE

Sun's wide selection of "Job Proved" petroleum products, plus the vast experience of Sun Engineers, can help you cut costs, step up production, and improve quality. Every Sun product, after its development in the laboratory, must pass rigid and exhaustive tests in actual use. When the worth of the product has been completely demonstrated in this way, then—and then only—it is given the "Job Proved" stamp and offered for sale. Detailed product information and the help of Sun Engineers are yours for the asking. Call your local Sun Office.

SUN OIL COMPANY
PHILADELPHIA 3, PA.
Sun Oil Company, Ltd., Toronto and Montreal

INDUSTRIAL OILS



Original charge of Sunvis as good as new after three years' use in hydraulic press.

SUNVIS 900 OILS—Unexcelled for turbine lubrication, for use as a hydraulic medium, for circulating systems and similar applications requiring longest possible oil life, plus maximum protection to equipment. Sunvis 900 Oils have a high viscosity index and uniform 0°F. pour point, and are fortified against corrosion and oxidation.

SUNVIS OILS—Give long, trouble-free service in all types of industrial reservoirs and circulating systems operating at normal temperatures. Sunvis Oils have uniform high viscosity index, low pour point, and low carbon content.

SUNVIS H.D. 700 OILS—For internal combustion engines operating under heavy-duty conditions, or where hydraulic valve-lifters are used; for circulating systems and other industrial applications where contamination is a factor. The additives in Sunvis H.D. 700 Oils supply detergency, and minimize oxidation and corrosion.

SUNVIS 800 OILS—Special heavy-duty lubricating oils used in railroad diesel engines equipped with silver-alloy bearings.

SUNVIS 2200 AND SUNVIS 2300—Heavy-Duty Supplement #1 and Supplement #2 quality oils respectively. For use in diesel engines where high-sulfur fuels may be encountered.

DYNAVIS OILS—For internal combustion engines operating at moderate loads and speeds. These low-pour-point, high-viscosity-index, inhibited oils help prevent formation of harmful corrosive and sludge-forming acids.

CIRCO OILS—Straight mineral oils for general lubrication of industrial machinery. Unsurpassed for once-through applications, regardless of operating temperatures.

SUNTAC OILS—Recommended for general lubrication of all machines subjected to sudden shocks and load reversals. Compounded to increase adhesiveness, Suntac Oils cling to bearing surfaces and supply constant, superior lubrication.

STEAM CYLINDER OILS—Lubricants of high flash and fire point for saturated or superheated steam conditions and for worm gear speed-reduction units.

SUNOCO WAY LUBRICANT—Eliminates "stick-slip" of tables and scoring of ways. Noncorrosive, with outstanding metal-wetting and adhesive properties, ample viscosity and E.P. qualities. Approved by 36 leading machine tool manufacturers.

ROCK DRILL OIL—High-film-strength oil for use in jackhammers, stopers, drifters, and similar equipment.

INDUSTRIAL GREASES

Sun grease increases steel mill production by cutting bearing failures 92%.

SUN GUN GREASES—Smooth greases made with medium-viscosity oil. Stable under pressure in power and booster guns.

"JOB PROVED" IN EVERY INDUSTRY

SUN

SUN ADHESIVE PRESSURE GREASES—Won't drip or splash. Excellent lubricants for open-gear applications.

SUN DARK PRESSURE-SYSTEM GREASES—For power-driven central grease lubricating systems in heavy industries. Also used as "medium cup greases."

SUN MINE CAR GREASES—Available in several grades. Suitable for both antifriction bearings and plain-bearing cavity-type wheels.

SUN MINING MACHINE LUBRICANT—Semi-solid. For use where a light but adhesive grease is required. Resists separation and decomposition.

SUN ROLLER BEARING GREASES—For use on electric motors and generators and high-temperature machinery equipped with ball or roller bearings.

SUN GEAR COMPOUNDS—Black adhesive open-gear compounds and wire-cable greases. Recommended for power presses, mining machinery, worm reduction mills, crushers, pump gears, etc.

SUNOCO TRACTOR ROLLER COMPOUND—For crawler-type tractors. Provides good lubrication with exceptional sealing qualities.

METALWORKING OILS

Ball bearing manufacturer finds that Sunicut increases tool life 15%, eliminates sludging.

SUNICUT—Straight (non-emulsifiable) transparent cutting oils. Various grades for automatic screw machines and heavy-duty machining operations. Permit high speed production with excellent finishes, long tool life.

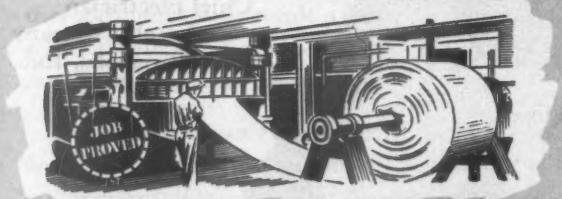
SUNOCO EMULSIFYING CUTTING OIL—An emulsifiable oil which produces a stable white emulsion. Efficient and economical cooling and lubricating medium for turning, milling, drilling, and other metalworking operations on both ferrous and nonferrous metals. It is also an excellent grinding coolant. Available in heavy-duty grades too.

SUN QUENCHING OILS—Specially refined oils designed to aid development of maximum physical properties in a wide variety of steels.

SUN TEMPERING OILS—Specially refined oils for tempering steel. Because of their low carbon content and stability under heat, these oils have an unusually long service life.

SUN ROLLING OILS—Straight and emulsifying oils which will permit maximum production in rolling steel, aluminum, brass, and copper.

RUBBER-PROCESS AIDS



Two Sun rubber-process aids save manufacturer $6,000 a year by taking the place of five competitive products.

CIRCOSOL-2XH—An elasticator and process aid for natural rubber and especially for GR-S. Outstanding for sponge rubber.

CIRCO LIGHT PROCESS-AID—A processing agent and excellent softener for natural rubber, natural rubber reclaims, and neoprene synthetic rubber. Used for GR-S to some extent.

SUNDEX-53—An inexpensive product suitable for processing GR-S and blends of GR-S and natural rubber. An established process aid for rubber footwear stocks and semihard rubbers.

CIRCOMAR-5AA—A dark-colored product for processing natural and GR-S rubber used in tire-making. Also used in reclaiming natural-rubber scrap. Replaces asphalt fluxes. Free-flowing at room temperature.

REFRIGERATION OILS

Hotel turns to Suniso for its ice-making equipment; eliminates separation troubles, cuts oil costs 20%.

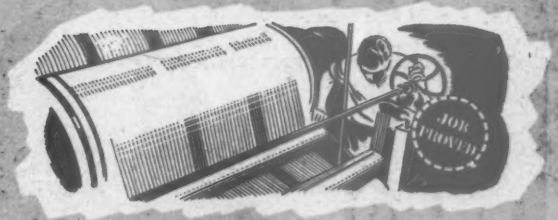
SUNISO REFRIGERATION OILS—High-quality oils having extremely low pour points, extremely low wax-separating characteristics, a high degree of stability, and long life. Initially neutral and resistant to formation of detrimental acids. Suniso grades are available to meet all low, normal, and high temperature conditions. The most widely used oils in refrigerating and air-conditioning.

SUNOCO WAXES

Waxes, "tailor made" to provide the exact properties demanded by different industries, are now available from Sun's new multimillion-dollar wax plant. Revolutionary manufacturing methods make it possible to retain only the wax portions desired for a particular use, while discarding those which might be detrimental.

Sunoco Waxes are precision-controlled for quality and uniformity of all physical and chemical characteristics important to the user. The various grades of Sunoco Wax are recommended on the basis of their ability to give superior performance on the specific job.

TEXTILE OILS



Sunotex replaces three formula components in textile mill; also saves 28% on costs.

SUNOTEX TEXTILE-PROCESS AIDS—Designed to impart desired additional properties to various fibers during their processing from the raw state into a manufactured product. All Sunotex textile-process aids are emulsifiable in water. Highest rating in Fade-Ometer tests.

SUN COTTON CONDITIONERS—Processing materials which prevent waste by cutting down excessive amounts of fly (fine air-borne lint particles).

SUN ASBESTOS FIBER CONDITIONER—Sprayed on asbestos during processing to keep fibers from being damaged or broken down. Harmful dust is minimized when this product is used.

SUN CORDAGE OILS—Generally used alone, but adaptable to various formulas used by cordage manufacturers. Selected products, highly compatible with additives.

SUNOTEX MACHINE OIL—One lubricant for nearly every kind of textile machine. A high-quality mineral oil and additive combination which prevents rust, clings to moving parts, and minimizes wear. Scours out of all kinds of fabrics easily and completely.

ADDITIONAL INDUSTRIAL PRODUCTS

SUN SOLVENTS—Sun Spirits for the thinning of paints, varnishes, and enamels, for metal-cleaning, and certain types of processing and extraction . . . a pure, water-white petroleum solvent free of corrosive sulfur. Other Sun solvents with special properties are available for the chemical industry.

SUN LEATHER OILS—Petroleum-base leather oils. Used for obtaining the desired tensile strength, proper temper, and controlled moisture content. Maintain a light even color, mix well, and distribute evenly.

INDUSTRIAL PRODUCTS

SUNOCO®

"We don't have any more needless fuse blows on our Air Compressor circuit since we installed FUSETRON dual-element FUSES"

"Prior to the time we installed Fusetron fuses to protect the circuit feeding the 125 h.p. 220 volt, 3 phase motor on our air compressor we were troubled with fuses blowing needlessly.

"On an average of once every two weeks one of the 400 ampere, 250 volt renewable fuses protecting the circuit would open on the starting current of the motor.

"About May of 1947 we replaced the fuses with 400 ampere Fusetron fuses. Since then we have not had the circuit down once because of a needless blow."

Leon C. England.
Chief Electrician
Link Belt Company
Indianapolis, Ind.

Fusetron DUAL ELEMENT Fuses

give 10-Point Protection

1. ★ Protect against short circuits.
2. Protect against needless blows caused by harmless overloads.
3. Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5. Protect motors against burnout from overloading.
6. Protect motors against burnout due to single phasing.
7. Give DOUBLE burnout protection to large motors — without extra cost.
8. Make protection of small motors simple and inexpensive.
9. Protect against waste of space and money — permit use of proper size switches and panels.
10. Protect coils, transformers and solenoids against burnout.

★ Fusetron Fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

Act on the Facts

Don't risk losses in your plant

One **needless** shutdown,
One **lost** motor,
One **destroyed** panel or switch,
One **burned out** solenoid—

May cost you more than replacing every ordinary fuse with a FUSETRON dual-element fuse.

But, simply knowing that FUSETRON fuses do save money is knowledge — but it isn't action.

By passing the word along that all purchase and stock records should call for FUSETRON dual-element fuses, you have action that begets money saving.

What is the FUSETRON Dual-Element FUSE?

A fuse link combined with a thermal cutout—the result, a fuse with tremendous time-lag and much less electrical resistance.

They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to the same dimensions as ordinary fuses, FUSETRON Fuses fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.

(FUSETRON is a trade mark of the Bussmann Mfg. Co., Division of McGraw Electric Co.)

Bussmann Mfg. Co., University at Jefferson
St. Louis 7, Mo. (Division McGraw Electric Co.)

Please send me complete facts about FUSETRON Dual-Element FUSES.

*Name*_____

*Title*_____

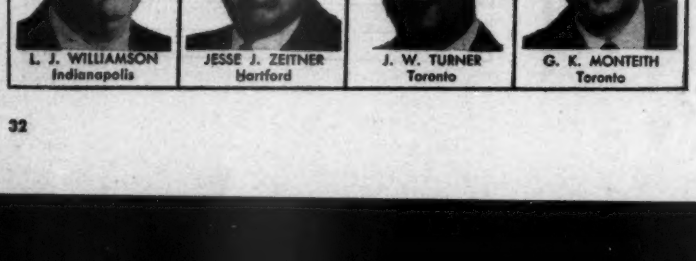
*Company*_____

*Address*_____

*City*_____ *State*_____ 151

Greetings AND WARM *Personal Wishes*

FROM THE LEGGE MEN OF AMERICA

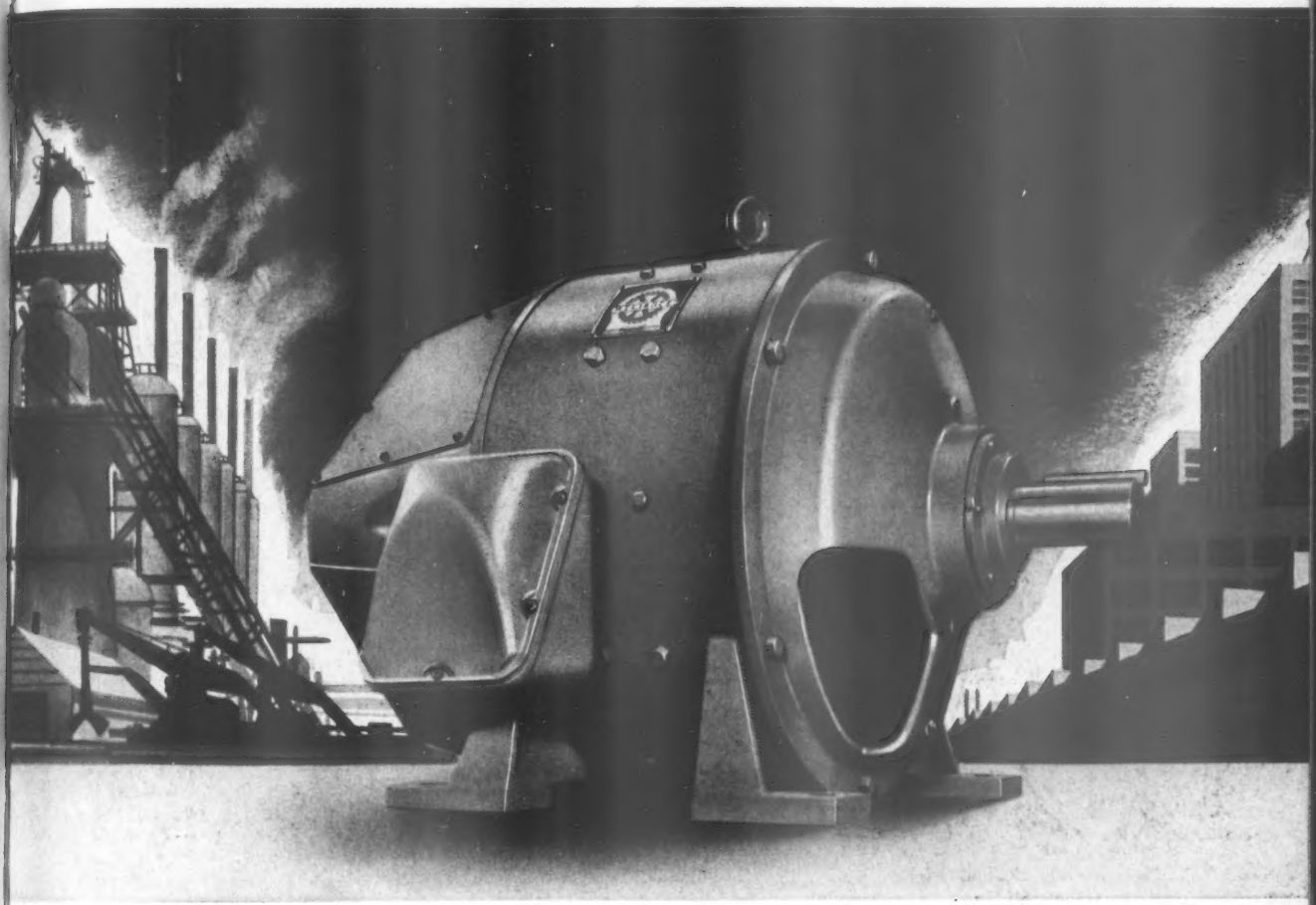


YOU'RE SAFE WHEN YOU HAVE LEGGE TO STAND ON

LEGGE SYSTEM
of Safety Floor Maintenance

Walter G. **LEGGE** *Company, Inc.*
Architects Bldg., 101 Park Avenue
New York 17, N. Y.

The Toughest Motors Ever Built...



...for the toughest jobs in plant, mill or mine

Reliance has concentrated on the manufacture of constant *and* adjustable-speed motors for nearly 50 years. Working with users of motor drives in every industry, Reliance engineers have constantly improved their basic heavy duty design to maintain the recognition of Reliance Type 'T' as "The Toughest Motors Ever Built". Proof of this recognition lies in the fact that they continue, year after year, to be the work-horses of American industry. When these tough Type 'T' Motors are put to work for you they will prove their ability to deliver dependable power—*longer.*

RELIANCE
TYPE 'T' HEAVY DUTY
D-C. MOTORS

Facts behind their outstanding durability

On the Other Side . . .

Sales Representatives in Principal Cities

RELIANCE ELECTRIC AND ENGINEERING CO.

1070 IVANHOE ROAD • CLEVELAND 10, OHIO

CANADIAN DIVISION: WELLAND, ONTARIO

RELIANCE Type 'T' Heavy Duty D-C. MOTORS

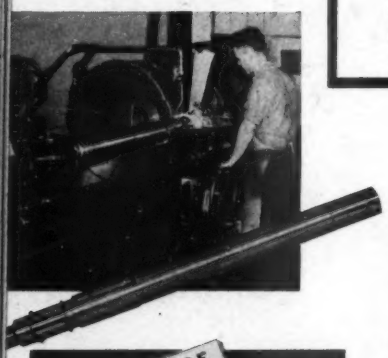
MANY Extras Make Them THE TOUGHEST MOTORS EVER BUILT!

Heavy Duty Armatures
Precision-Balanced

Armature cores are made of highest grade silicon steel punchings assembled under pressure and tightly held between end flanges. After careful winding, coils are given the maximum protection through Reli-X Insulation. And all completed armatures are dynamically balanced to assure smooth running motors!

Heavy Duty Brushes and Brushholders

Brushes of high grade electrographite carbon have flexible shunts. Current density is maintained within well-established limits over the full range of load. The particular design of the cast bronze brushholders and precision methods of brush rigging combine to promote smooth operation and good commutation.

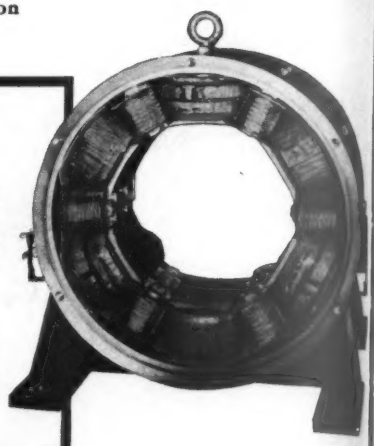


Heavy Duty Shafts
Precision-Turned Finish Ground

Heavy, liberally designed shafts of finest forging-quality steel are precision-turned for accuracy in all dimensions. Each and every shaft is then finish-ground to guarantee additional strength, precision fits and interchangeability.

Heavy Duty Coils
Reli-X Insulated

Precision procedures in winding and assembling coils are followed by the use of selected materials and exclusive methods in the Reli-X Insulation Process. Resulting coil units are compact, yet extra-sturdy —with unsurpassed mechanical protection and insulation at all points.

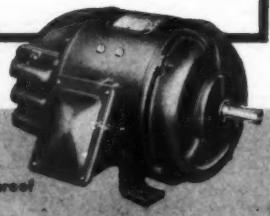


In this new booklet

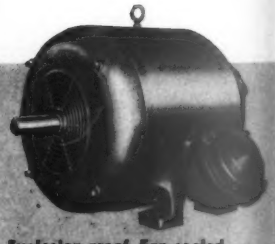
Many Other Important Extras Described in Detail

Here is word and picture proof of all of the many extra precision steps taken in the manufacture of Reliance Type 'T' Heavy Duty D-c. Motors to give you dependable power—*longer*. Also contains data you should have to select the right D-c. motor for any job. Specify Bulletin C-2001 in your request.

Drip-proof Protected



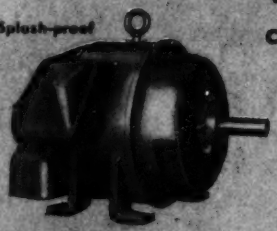
Drip-proof



Explosion-proof, Fan-cooled

SIX from a COMPLETE RANGE of MECHANICAL DESIGNS

¾ to 1000 Horsepower for Constant and Adjustable Speeds



Splash-proof

Totally-enclosed, Fan-cooled

Integrally-mounted Blower and Filter for Force Ventilation

Sales Offices in Principal Cities

RELIANCE ELECTRIC AND ENGINEERING CO.

1070 IVANHOE ROAD • CLEVELAND 10, OHIO

CANADIAN DIVISION: WELLAND, ONTARIO

ERIEZ MAGNETIC ATTRACTIONS

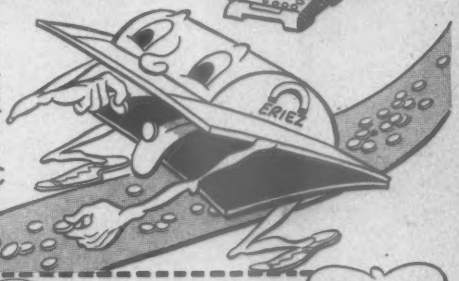
ERIEZ MANUFACTURING CO., ERIE, PA., U.S.A. • PRODUCERS OF MAGNETIC SEPARATORS AND SELLERS OF (RCA) ELECTRONIC METAL DETECTORS

RUBBER GLOVE MAKERS...WERE PLAGUED WITH SMALL HOLES IN THEIR PRODUCT. CAUSE: **TRAMP IRON** SPECKS IN THE LIQUID LATEX RUBBER...REMEDY: AN **ERIEZ** STAINLESS STEEL-BODIED MAGNETIC TRAP IN THE PROCESSING PIPELINE. IRON PASSAGE WAS CHECKED ENTIRELY. WORKS, TOO, IN FOOD LINES OR IN ANY LIQUID FLOW LINE.

PRODUCTION INCREASED 1200% ON ONE OPERATION AT L.C. SMITH AND CORONA TYPEWRITERS, INC. .....

...WHEN **ERIEZ** PERMANENT MAGNETIC PULLEYS WERE PUT IN BELT CONVEYOR LINES TO SEPARATE METAL PARTS FROM TUMBLING STONES. NEW **ERIEZ** ALNICO V **ATOM** MAGNET PULLEYS ARE THE STRONGEST KNOWN!

FOR SORTING PENNIES...WHITE (STEEL) ONES FROM COPPER....U.S. MINTS IN PHILADELPHIA AND SAN FRANCISCO CHOSE POWERFUL **ERIEZ** MAGNETIC SEPARATORS. **ERIEZ** NEW PERMANENT PLATE MAGNETS ...KNOWN AS **ATOM** MAGNETS.....SEPARATE ALMOST ANY MAGNETIC FROM NON-MAGNETIC MATERIAL.



METAL IN CORN FLAKES... CAN BE TOUGH ON TEETH AND STOMACH. TO KEEP ALL METAL OUT OF ITS CEREAL PRODUCTS, *GENERAL MILLS* USES THE *R.C.A.* ELECTRONIC METAL DETECTOR, SOLD BY **ERIEZ**. IT WARNS AGAINST ANY METAL AS SMALL AS .039" IN DIAMETER!

RETURN THIS COUPON.

ERIEZ MANUFACTURING COMPANY
209 STATE STREET, ERIE, PA.

MY CONTAMINATION OR SEPARATION PROBLEM IS:

_____

_____

PLEASE SEND LITERATURE ☐

HAVE REPRESENTATIVE CALL ☐ PROMPTLY ☐ WHEN IN AREA

NAME _____

TITLE _____

COMPANY NAME _____

STREET _____

CITY _____ ZONE ___ STATE _____

51A

How Allis-Chalmers Solved Transformer

ALLIS-

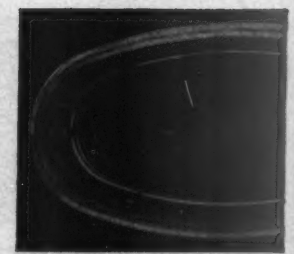
Pioneers in Load Ratio

PROBLEM:

To carry away heat losses of one 750 kva and two 2000 kva transformers from a basement in which adequate ventilation did not exist. There was no other possible location. The cost of adequately ventilating the basement would be prohibitive.

SOLUTION:

Water-cooling for transformers recommended . . . a method commonly used to cool large transformers in hydro-electric plants. *Chlorextol* liquid transfers heat from windings to water tubes located inside transformer tank. Water carries heat away.



Experience Heat Loss Problem!

NUMBER 1 IN A SERIES
Solving Industrial Power Distribution Problems

ALLIS-CHALMERS LOAD CENTER UNIT SUBSTATIONS

A PROMINENT MIDWEST MANUFACTURER had this problem: How to locate unit substations — one rated 4000 kva, the other 750 kva —right at load centers, in a basement where ventilation was inadequate to remove transformer heat losses by the usual radiator-to-air method.

Allis-Chalmers, called in on the job, recommended and built *water-cooled* load center transformers. Although commonly used on large, high-voltage power transformers, water-cooling as applied to load center transformers was considered very unusual. Yet, in this case, the arrangement proved completely satisfactory — so satisfactory that when additional substations were required, Allis-Chalmers LCS unit-subs with water-cooled transformers were specified! Thus, what had started out as a solution to an emergency situation became a design specification for this firm.

CALL IN ALLIS-CHALMERS UNIT-SUBSTATION EXPERTS AT THE BASIC PLANNING STAGE

The experience of this manufacturer illustrates how Allis-Chalmers Unit-Substation engineering can serve *you!* And the time to call on this experience is during basic planning, early enough for sound equipment recommendations. An A-C representative is ready to go into detail with you at your convenience. Call your nearby A-C Sales Office, or write direct. A-2914

ALLIS-CHALMERS, 1078A SO. 70 ST.
MILWAUKEE, WIS.

Chlorextol is an Allis-Chalmers trademark.

CHALMERS

A-C

Control — Originators of 5/8% Step Regulation

TIGHT SQUEEZE!

Furthermore, the 4000 kva double ended substation had to fit between pillars only 36 ft apart. Note how selector switches were placed on *front* of transformers, making the necessary space-saving possible . . . a second problem solved by A-C!

SEND FOR HELPFUL AIDS

Bulletin 11B6285A, "How Power at Load Centers Pays Off!";
Bulletin 11B6325B, "Check List to Simplify Unit Substation Planning";
Bulletin 11B6895, "Planning and Engineering Guidebook for LCS Unit Substations".

See for yourself why...

BOSTON Gear PILLOW BLOCKS

with the exclusive

SAFETY-VENT-SEAL

are your best buy

SAFETY-VENT-SEALED!
Unique labyrinth seal automatically controls the correct amount of lubricant and prevents blowing out of seals. Keeps in lubricant while it keeps out dirt.

GENUINE BOSTON GEAR QUALITY IRON HOUSING!
Rigid, one piece, precision machined; providing a solid mounting in any position.

FULLY SELF ALIGNING!
Spherically ground outside bearing surface automatically aligns itself in the Boston Gear iron housing. This means accurate alignment of shafts — quick mounting, easy installation.

PRECISION BALL BEARINGS!
Precision ground chrome alloy ball bearings and Mirror-Finished bearing steel ball races assure smooth, quiet running and long life.

BOSTON GEAR PRECISION CRAFTSMANSHIP!
Over 70 years of experience and the most advanced tools and inspection equipment known to the industry.

FROM NEARBY STOCK!
BOSTON Gear PILLOW BLOCKS and FLANGED CARTRIDGES are stocked by *eighty* experienced, competent Authorized Boston Gear Distributors — *one near you.*

WRITE FOR BOSTON GEAR CATALOG NO. 58
It contains complete information on BOSTON Gear Pillow Blocks and over 4500 stock items of quality power transmission equipment.

BOSTON GEAR WORKS
62 HAYWARD ST., QUINCY 71, MASS.

BOSTON Gear STOCKS ARE Here
at factory prices!
Save time and money—assure yourself of uniform quality and perfect interchangeability by standardizing on Boston Gear quality products—stocked at these Authorized Boston Gear Distributors — one near you!

AKRON, OHIO
Bearing Distributors, Inc.
280 E. Exchange St.
ALBANY, NEW YORK
Sugar-Smack Sup. Co.
364-366 Broadway
ALLENTOWN, PENNSYLVANIA
Wm. H. Tayler & Co., Inc.
250-256 Hamilton St.
ATLANTA, GEORGIA
J. M. Tull Metal & Sup. Co.
283 Marietta St.
BALTIMORE, MARYLAND
Carey Mchy. & Sup. Co.
3501 Brehm's Lane
BIRMINGHAM, ALABAMA
Owen-Richards Co., Inc.
1009 2nd Ave. N.
BOSTON, MASSACHUSETTS
Chandler & Farquhar, Inc.
900 Commonwealth Ave.
BRIDGEPORT, CONNECTICUT
Hanley Hardware Co.
1120 Main St.
BROOKLYN, NEW YORK
H. E. Dickie
314-346th St.
BUFFALO, NEW YORK
Buffalo Bearings, Inc.
25 Terrace
Root, Neal & Co.
44 Peabody St.
CHARLOTTE, NORTH CAROLINA
Matthews-Morse Sales Co.
909 S. Mint St.
CHICAGO, ILLINOIS
Berry Bearing Co.
2633-35 S. Michigan Ave.
Boston Gear Works
935 W. Washington Blvd.
Chgo. Pulley & Shafting Co.
23 N. Desplaines St.
Samuel Harris & Co.
114-116 N. Clinton St.
Power Trans. Equip. Co.
1245 W. Fulton St.
CINCINNATI, OHIO
Queen City Sup. Co.
Pearl & Elm Sts.
CLEVELAND, OHIO
Bearing Distributors, Inc.
2618 Carnegie Ave.
Boston Gear Works
311 St. Clair Ave., N. W.
Mac-Sherwood Sup. Co.
800 Lime Road
COLUMBUS, OHIO
Ohio Trans. Co.
666 Parsons Ave.
DALLAS, TEXAS
Geo. J. Fix Co.
2413-15 Commerce St.
DAYTON, OHIO
Klinger-Dilli
1041 So. Patterson Blvd.
DENVER, COLORADO
Western Belting & Packing Co.
1720-28 Wazee St.
DES MOINES, IOWA
Standard Bearings Co.
1016 Grand Ave.
DETROIT, MICHIGAN
Chas. A. Strelinger Co.
149-165 E. Larned St.
EVANSVILLE, INDIANA
Bearings Service Co., Inc.
9 N. W. First St.
GREENSBORO, NORTH CAROLINA
Trans. Supplies, Inc.
403 Walker Ave.
HAMILTON, ONTARIO
Renold-Coventry, Ltd.
443 King St. E.
HARTFORD, CONNECTICUT
Silliter-Holden, Inc.
P. O. Drawer 1140
HOUSTON, TEXAS
Geo. J. Fix Co.
2702 Polk Ave.
INDIANAPOLIS, INDIANA
Vonnegut Hardware Co.
402 W. Maryland St.
JACKSONVILLE, FLORIDA
S. B. Hubbard Co.
32 W. Bay St.
KANSAS CITY, MISSOURI
Bittelell Mchy. & Sup. Co.
1219 McGee St.
KNOXVILLE, TENNESSEE
Hoyt N. Payne Co.
410 E. Depot Ave.
LANCASTER, PENNSYLVANIA
Herr & Co., Inc.
Prince & Chestnut Sts.
LONDON, ONTARIO
Renold-Coventry, Ltd.
277 Piccadilly
LONG ISLAND CITY, NEW YORK
L. C. Bigler & Co., Inc.
11-06 Jackson Ave.
LOS ANGELES, CALIFORNIA
Andrews Hardware & Metal Co.
324 S. Main St.
Garrett Supply Co.
3844 S. Santa Fe Ave.
LOUISVILLE, KENTUCKY
Industrial Equip. Co.
7th & Myrtle Sts.
MEMPHIS, TENNESSEE
Lewis Sup. Co.
Main at Butler Sts.
MIAMI, FLORIDA
Gondas Corp.
2140-50 N. Miami Ave.
MILWAUKEE, WISCONSIN
Western Iron Stores Co.
319-331 East Clybourn St.
Wisconsin Bearing Co.
915-917 N. Market St.
MINNEAPOLIS, MINNESOTA
R. C. Duncan Co., 1300 4th St. S.
Minnesota Bearing Co.
1619 Hennepin Ave.
MONTREAL, QUEBEC
Renold-Coventry, Ltd.
1006 Mountain St.
NASHVILLE, TENNESSEE
Industrial Bearing Service, Inc.
411 Lafayette St.
NEWARK, NEW JERSEY
Sauter, Schilling & Stoltt
419 Plane St.
NEW ORLEANS, LOUISIANA
McLellan A-C Sup. Co.
2375 Tchoupitoulas St.
NEW YORK, NEW YORK
L. C. Bigler & Co., Inc.
250 W. 54th St.
Boston Gear Works, 480 Canal St.
Frank Tracy, Inc., 202 Centre St.
OAKLAND, CALIFORNIA
Bearing Specialty Company
2503 Broadway
C. W. Marwedel
11th & Alice Sts.
PHILADELPHIA, PENNSYLVANIA
Bearings, Inc.
1410 W. Hunting Park Ave.
Boston Gear Works
Broad St. Car. of Lycoming & 16th Sts.
Lindsay, Oberholtzer & Co.
4432 Ridge Ave.
Maddock & Company
42 N. Sixth St.
Pryor Bearing Company
685 N. Broad St.
PITTSBURGH, PENNSYLVANIA
Semers, Fitler & Todd Co.
313-327 Water Street
PORTLAND, OREGON
Woodbury & Co.
133 S. W. 2nd Ave.
PROVIDENCE, RHODE ISLAND
Machine Parts Corp.
271 Washington St.
QUEBEC, QUEBEC
Renold-Coventry, Ltd.
5 Bertamaque Ave.
QUINCY, MASSACHUSETTS
Boston Gear Works
14 Hayward St.
RICHMOND, VIRGINIA
Industrial Sup. Co.
15th & Franklin Sts.
ROCHESTER, NEW YORK
John M. Forster Co.
110 Mill St.
ST. LOUIS, MISSOURI
Colcord-Wright Mchy. & Sup. Co.
1223-1229 N. Broadway
SALT LAKE CITY, UTAH
Bearings Service & Supply Co.
68 W. Fourth South St.
SAN FRANCISCO, CALIFORNIA
Bearing Engineering Co.
1343 Mission St.
Boston Gear Works
123 10th St.
C. W. Marwedel
1235 Mission St.
SAN JOSE, CALIFORNIA
Masterson Bearing Co.
976 South First St.
SEATTLE, WASHINGTON
Craggs & Co.
932 First Ave. S.
SPRINGFIELD, MASSACHUSETTS
Boston Gear Works
29 Worthington St.
SYRACUSE, NEW YORK
Syracuse Sup. Co.
314 W. Fayette St.
TAMPA, FLORIDA
Southern Pump & Sup., Inc.
902 Twiggs St.
TOLEDO, OHIO
Ohio Belting & Trans. Co.
406 Orange St.
TORONTO, ONTARIO
Renold-Coventry, Ltd.
50 Edward St.
TRENTON, NEW JERSEY
Wiley-Hughes Sup. Co.
801 New York Ave.
VANCOUVER, B. C.
Renold-Coventry, Ltd.
1066 Seymour St.
WATERBURY, CONNECTICUT
White Supply Co.
297 Thomaston Ave.
WILKES-BARRE, PENNSYLVANIA
Holmes Metallic Co.
519-521 S. Main St.
WINSTON-SALEM, NORTH CAROLINA
Koster Machinery Co.
300 E. 3rd St.
WORCESTER, MASSACHUSETTS
W. M. Steele Co.
171 Fremont St.

BOSTON Gear STOCKS ARE Near

what's the Greatest Nuisance in pump maintenance?

- ✓ Periodic lubrication?
- ✓ Leaky stuffing boxes?
- ✓ Handling repairs in your own plant?

You can get rid of all three with a new De Laval GS Pump

Because —

We've eliminated lubrication.
Like many modern motors, the GS Pump has pre-lubricated bearings. You can throw away the grease gun and tear up your lubrication records.

We've elminated stuffing boxes.
Why fuss with tightening, packing and repacking stuffing boxes? The mechanical seal on the GS Pump is simple, effective and proven.

We've eliminated field repairs.
Every working part of the GS Pump . . . every part subject to wear, is contained in one easily replaced rotor assembly. Through our Service and Exchange Plan new rotors are available for immediate shipment from stock. Put the new one in and return the old one for credit on serviceable parts—Or, if you wish, exchange the entire pump for a factory rebuilt and guaranteed pump.

Capacities . . to 400 gpm—Heads . . to 230 ft.—3 Sizes . . 2½" to 4"

DE LAVAL

DE LAVAL STEAM TURBINE CO.
TRENTON 2, NEW JERSEY

Just drop the coupon in the mail for full details of this outstanding new pump development. GP-24

DE LAVAL STEAM TURBINE CO.
Trenton 2, New Jersey

Please send me a copy of your new GS Pump Bulletin.

Name_____

Company_____

Street_____

City_____ **State**_____

INDUSTRIAL EYE ACCIDENT **COSTS** **UP** 78½% SINCE 1939

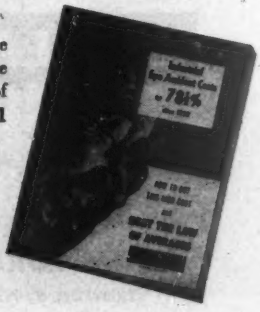
Production Goes Up... Operating Costs Go Down ..

when you eliminate High Eye Accident Costs from what you make and sell!

High eye accident costs can affect your operations adversely two ways: (1) They represent an unnecessary cost that inflates your selling price and hence cuts your volume. (2) They lower efficiency through increased unproductive time, idle machine charges, replacing key men with substitutes and by impaired worker morale. All this in addition to the direct costs for first aid and medical care.

Yet unlike other high costs that plague management today—*these can be cut.* How? By establishing an AO Eye Protection Program which can pay for itself in less than six months' time. Your AO Safety Representative can prove with case histories that an AO Program *works* — that goggles costing about $2.30 can save sums up to $44,000 annually! Ask him to call.

Ask your secretary to write for the FREE booklet on how to cut high eye accident costs and Beat the Law of Averages. **ADDRESS—Dept. Cp 31**



American Optical

SAFETY PRODUCTS DIVISION

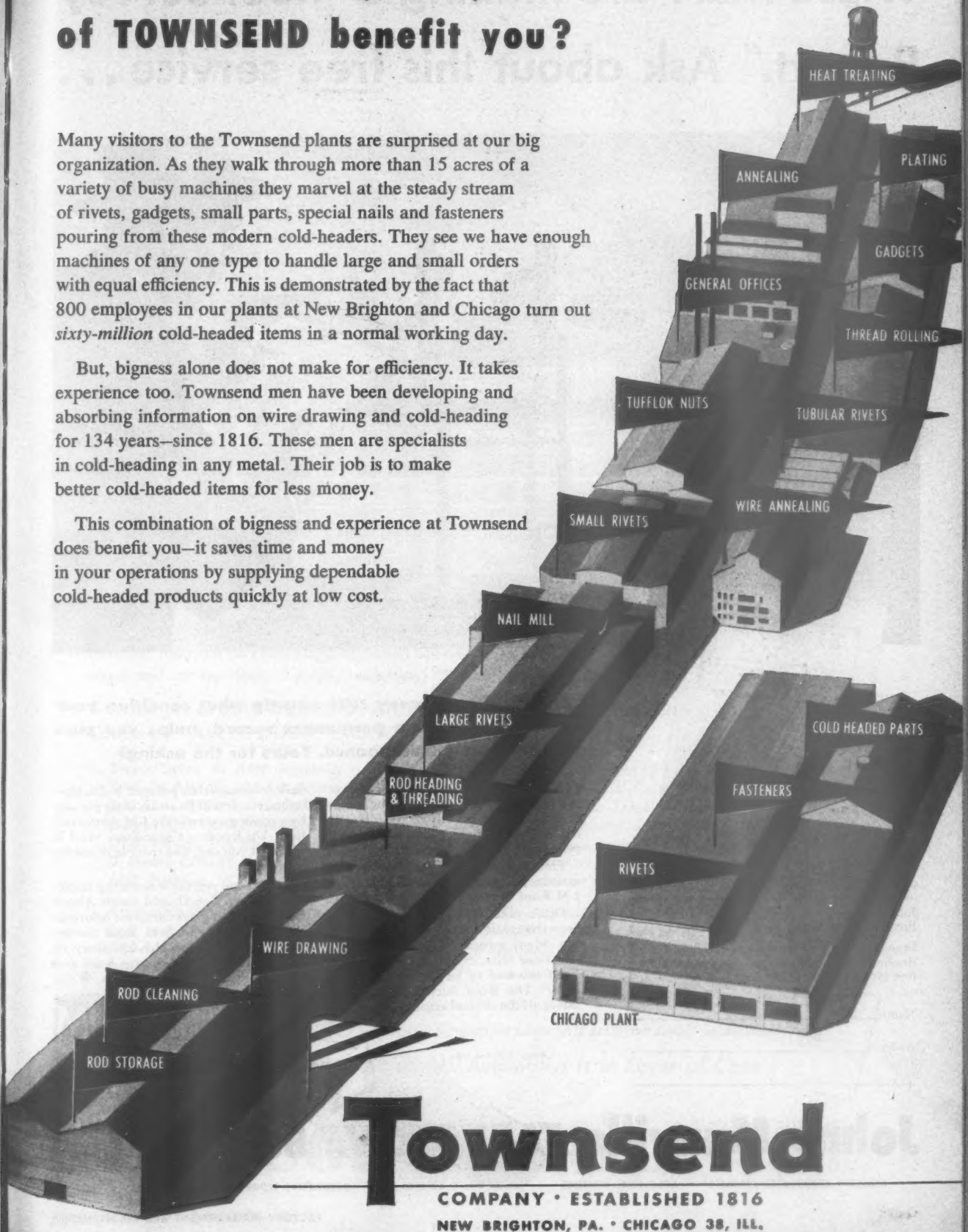
Southbridge, Massachusetts • Branches in Principal Cities

How does the size (BIG) and experience (LONG) of TOWNSEND benefit you?

Many visitors to the Townsend plants are surprised at our big organization. As they walk through more than 15 acres of a variety of busy machines they marvel at the steady stream of rivets, gadgets, small parts, special nails and fasteners pouring from these modern cold-headers. They see we have enough machines of any one type to handle large and small orders with equal efficiency. This is demonstrated by the fact that 800 employees in our plants at New Brighton and Chicago turn out *sixty-million* cold-headed items in a normal working day.

But, bigness alone does not make for efficiency. It takes experience too. Townsend men have been developing and absorbing information on wire drawing and cold-heading for 134 years—since 1816. These men are specialists in cold-heading in any metal. Their job is to make better cold-headed items for less money.

This combination of bigness and experience at Townsend does benefit you—it saves time and money in your operations by supplying dependable cold-headed products quickly at low cost.

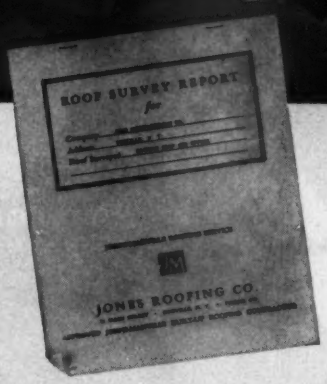


Townsend

COMPANY • ESTABLISHED 1816

NEW BRIGHTON, PA. • CHICAGO 38, ILL.

THESE MEN are making a "Roof Survey Report." Ask about this free service...



The Built-Up Roof Survey tells exactly what condition your roof is in, gives you a permanent record, helps you plan ahead for roofing maintenance. Yours for the asking!

TAKE ADVANTAGE of this *free* Johns-Manville service to find out the exact condition of your built-up roof. It will enable you to make plans *now* for repairs and maintenance in the future.

That's what plant engineers and maintenance executives *like* about the J-M Roof Survey Plan.

Don't take *your* roof for granted, even though it doesn't *seem* to be leaking. Many a roof with torn flashings, dried-out felts, even rotted decks has been *assumed* to be in "good condition." The Roof Survey Report will cover all the critical areas... flashings, deck, roofing felts, parapet walls, skylights, etc. It will be an accurate picture by a roofing *expert*—the J-M Approved Built-Up Roofing Contractor. And it will cost you only the trouble of *asking* for it.

Let us send you the interesting booklet, "Things You Should Know About Your Roof." It gives complete information about the *free* J-M Roof Survey Plan, together with the full story of the J-M Flexstone* Asbestos Roof and the Asbestile* Flashing System. Write Johns-Manville, Box 158, New York 16, N. Y.

Mail your Request today

Johns-Manville
Box 158, New York 16, N. Y.

Please have one of your Approved Built-Up Roofing Contractors see us about making a free survey of our roof.

Name_____

Address_____

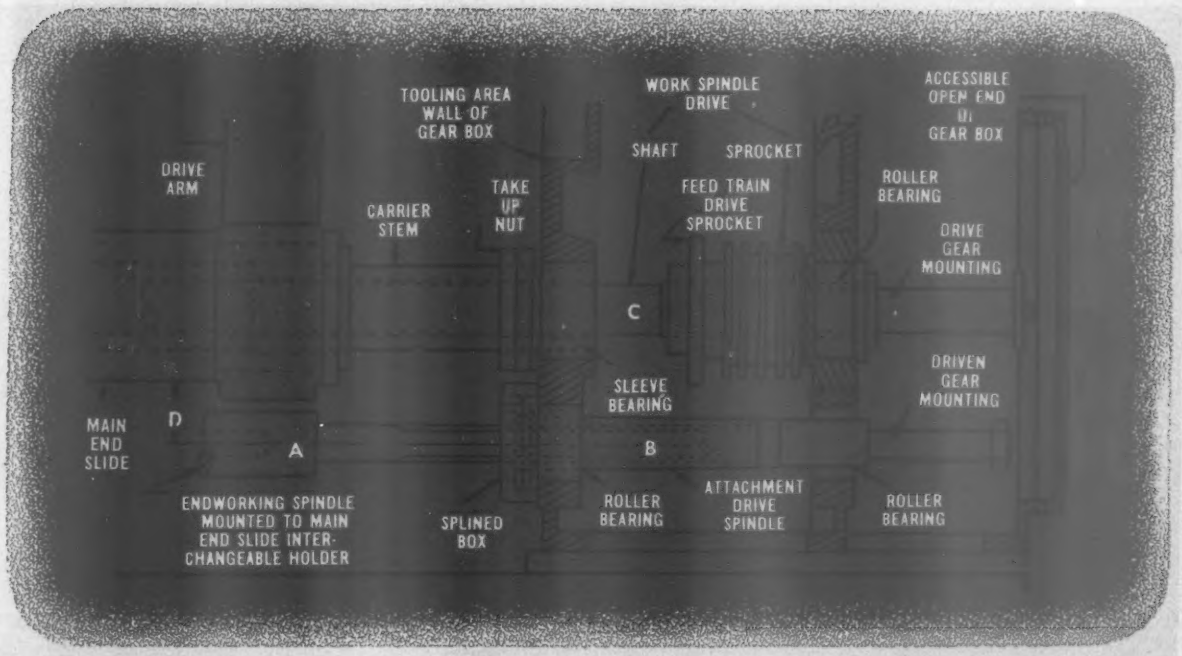
_____

*Reg. U. S. Pat. Off.

Made of ASBESTOS

Johns-Manville FLEXSTONE Built-Up Roofs

ASBESTOS CORRUGATED TRANSITE* • ACOUSTICAL CEILINGS • DECORATIVE FLOORS • MOVABLE WALLS • ETC.



BEWARE OF THE BAR IN BARGAIN

With manufacturing costs much the same the country over, the purchase prices of various brands of a given type of machine tool should be about equal for equal value. Healthy competition tends to level out prices.

All of the best facilities of the highest priced machine may not be needed, and should not be expected of the lowest priced machine. The value of any brand depends on how well its facilities meet the particular needs of the individual plant.

Of all required facilities, those of low-cost operation and maintenance are universally considered important. A machine without them is a BAR to any GAIN at any PRICE.

An example of **LOW-COST OPERATION AND MAINTENANCE FACILITY** is the **EXCLUSIVE** Conomatic **"ALL POSITION" END ATTACHMENT**, which has:

1. **Direct Drive to ANY Rotating Tool, in ANY or ALL SIX, Main End Slide Positions. Solid Tapping in ANY THREE Positions on ONE Set-up. Die Head Swing, D, clears COLLET CAPACITY in ANY Position.**

The above drawing shows Endworking Spindle, A, in a Main End Slide Position of a 1½" SIX SPINDLE Conomatic. Its splined shaft is rotated by the Attachment Drive Spindle, B. The drive from the Work Spindle Drive Shaft, C, is indicated. The Spindle, A, rotates in its bearing in an interchangeable Holder mounted to the Main End Slide, whose travel it may take. Three levers and cams offer independent travel to any three Endworking Spindles per single set-up.

2. **Accessible OPEN-END Application and INTERCHANGEABLE Attachment HOLDERS. Selective Speeds and Feeds.**

Six Attachment Drive Spindles may be applied to one set-up. Two are machine equipment. There is drive facility for 168 Speeds between 132 and 6158 RPM for drilling, boring, etc. Std. Drive Gears offer 10 Threading Speed Ratios.

Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

Udylite PLATING CYLINDER

6 WAYS BETTER

1. GREATER ABRASION RESISTANCE
2. 30% MORE PERFORATED AREA
3. "DEEP-DIP" DESIGN
4. STRONGER CONSTRUCTION
5. LOWER INITIAL COST
6. OPERATES THROUGH ENTIRE CYCLE (ACID OR ALKALINE)

Consider the advantages of the Udylite 'Lucite' Plating Cylinder. This cylinder is made of heat resistant 'Lucite'—which offers greater abrasion resistance. And the shell is *mortised* and *cemented* into the cylinder heads—with door openings machined to a very close tolerance, providing perfect fit. Door clamps are designed to give maximum support to the door panel yet open easily and freely. Oversized superstructure with "Deep-Dip" design allows the cylinder to hang deep in the solution.

This 'Lucite' cylinder can be operated through the complete cycle—either acid or alkaline. And most important—the Udylite 'Lucite' Plating Cylinder is offered in 4 sizes with perforations 1/16" Diameter and Larger.

Call in your Udylite Technical Man today for full information concerning the Udylite 'Lucite' Plating Cylinder or write direct to *The Udylite Corporation, Detroit 11, Michigan.*

PIONEER OF A BETTER WAY IN PLATING

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

Photo T-4938 Handling one-ton packs of 26-gauge silicon steel sheets size 34" x 121" with inexpensive handpropelled Cleveland Tramrail crane and electric hoist.

TRAMRAIL System *Cuts Sheet Steel Handling Time 37½%*

STUDIES by Sangamo Electric Company, Springfield, Illinois, makers of precision electrical measurement instruments, revealed that even though their finished products are light in weight, materials handling amounts to a substantial percentage of the total factory payroll. Well over ⅓ of their handling costs is for raw material handling.

With a postwar production rate double that of prewar, it has been necessary for Sangamo to improve methods and purchase equipment to move greatly increased volumes of materials with a minimum addition of building and labor. A Cleveland Tramrail system for handling steel sheets in their receiving department, was one of the two most outstanding additions in this program made during 1948.

The Cleveland Tramrail system has reduced worker fatigue and accidents and has directly resulted in the saving of 12 manhours for every 70,000 lb. car of sheet steel unloaded. Whereas this job formerly required 32 manhours, it is now done in 20—a 37.5% reduction in time.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3259 EAST 284TH ST. WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

SIMPLIFIED DIMENSIONAL STANDARDS
For Pipe Sizes From ½ to 72 Inches

KAYLO
PIPE INSULATION
nesting

Reduces Inventory Stock ...Saves Storage Space

Kaylo Pipe Insulation reduces inventory requirements because of two features—its wide effective temperature range (up to 1200°F.) and its Simplified Dimensional Standards, which allow nesting.

Kaylo Pipe Insulation is produced in Simplified Dimensional Standards of thicknesses and diameters for pipe sizes from ½" to 72". O. D.'s of insulation correspond to O. D.'s of standard pipes, assuring proper fit for each pipe size and for nesting, when necessary. With this system of snug nesting, Kaylo Pipe Insulation fits all operating conditions, requires less items—reduces maintenance stock.

Kaylo Insulation is a calcium silicate (not glass). This inorganic material, insoluble in water and incombustible, retains its dimensional stability in long service under severe conditions. Exceptional strength and lighter weight make Kaylo Insulation easier to handle and apply.

KAYLO PIPE INSULATION is sectional for sizes ½" to 12"; tri-segmental for 8" to 23"; quad-segmental for 19" to 41"; K-segmental (18" sections) for 38" to 72".

KAYLO HEAT INSULATING BLOCK is available for single layer application in thicknesses from 1" to 6". It is made in all standard sizes up to 18" x 36".

See our CATALOG in SWEET'S FILE

KAYLO®

...First in Calcium Silicate

...pioneered by

OWENS-ILLINOIS GLASS COMPANY

Kaylo Division • Toledo 1, Ohio

SALES OFFICES: Atlanta • Boston • Buffalo • Chicago • Cincinnati • Cleveland
Detroit • Houston • Minneapolis • New York • Oklahoma City
Philadelphia • Pittsburgh • St. Louis • Washington

SEND COUPON FOR
KAYLO HEAT INSULATION LITERATURE

OWENS-ILLINOIS GLASS COMPANY
Dept. N-200, Kaylo Division • Toledo 1, Ohio

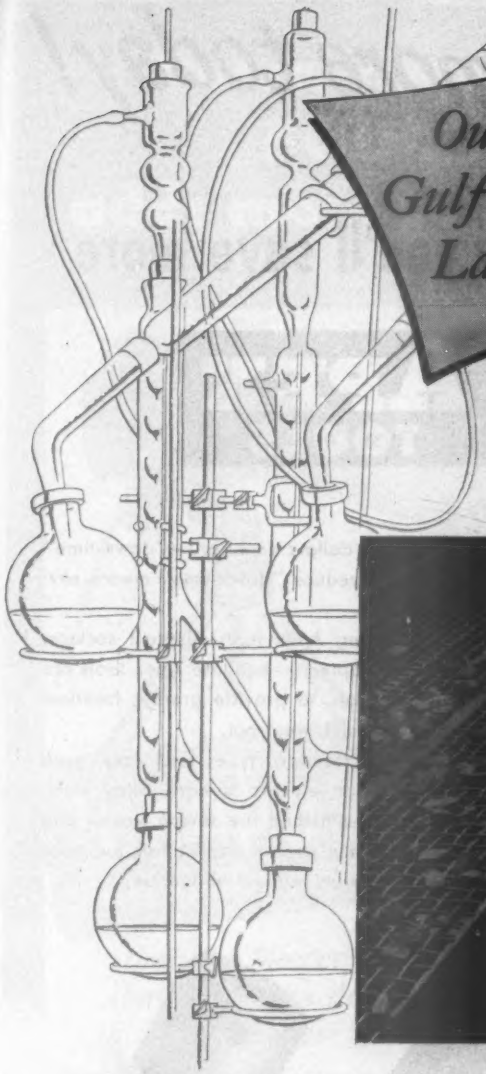
Gentlemen: Please send me descriptive literature on Kaylo Heat Insulation.

NAME.....

FIRM.....

ADDRESS.....

CITY.....STATE.....



Out of Gulf Research Laboratories—

a new Gulf Lubricant

that reduces wear, ends lubrication troubles in vibrating screens

Another outstanding Gulf lubricant to help reduce maintenance costs for important production equipment! Gulf Cam Grease combines all the properties necessary to insure improved lubrication of hardworking cams in shaker screens.

Because it has a high dropping point, Gulf Cam Grease does not leak out of eccentric strap bearings, even at the high temperatures encountered in severe service. Thus, for this application, it is superior to oil, which has a tendency to leak out, leaving the bearings unprotected and creating an accident hazard.

Just as important is the fact that Gulf Cam Grease is exceptionally stable at high operating temperatures—does not separate or oxidize appreciably. And unlike most high-temperature greases, Gulf Cam Grease is an effective lubricant where wet conditions prevail.

Gulf Cam Grease is recommended for cams or eccentrics on the shaker screens of coal breakers, preparation plants, and all types of rock and mineral processing equipment. Its use helps prevent overheating in bearings, and insures lower maintenance costs.

Perhaps this outstanding Gulf Lubricant can be used profitably in your plant. Write, wire, or phone and ask a Gulf Sales Engineer to call. Gulf Oil Corporation · Gulf Refining Company, Gulf Building, Pittsburgh, Pa.

FIFTY YEARS OF SERVICE
1901 GULF 1951
PETROLEUM AND ITS PRODUCTS

"down time" costs more today!

that's why you'll save more

by using APEX TOOLS

• Any way you figure it—in hours, dollars or labor—"down-time" is expensive. And any way you can reduce "down-time" means savings in time, money and manpower.

You'll have less "down-time" using Apex tools—impact sockets, universal sockets, extensions and adapters—because Apex tools are designed and built to stay on the job, to provide greater freedom from excessive tool breakage and quick wear-out.

Apex manufactures thousands of standard types and sizes, each precision-machined from high carbon electric furnace alloy steel, cold broached and heat-treated to withstand the severe strains and shocks of industrial service. If yours is a special application, just send sketch or blueprint for prompt quotation, without obligation.

CATALOG 19 lists styles, dimensions, type and size of drives. Write, on your company letterhead please, for your copy.

APEX TOOLS

sockets, extensions, adapters

THE APEX MACHINE & TOOL COMPANY

1025 S. Patterson Blvd., Dayton 2, Ohio

SAFETY FRICTION TAPPING CHUCKS • VERTICAL FLOAT TAPPING CHUCKS • SELF-RELEASING AND ADJUSTABLE STUD SETTERS • POWER BITS FOR PHILLIPS, FREARSON, SLOTTED HEAD, CLUTCH HEAD, HEX HEAD AND SOCKET SCREWS • HAND DRIVERS FOR PHILLIPS, FREARSON AND CLUTCH HEAD SCREWS • AIRCRAFT AND INDUSTRIAL UNIVERSAL JOINTS • SOCKETS AND UNIVERSAL JOINT SOCKET WRENCHES.

Down time due to FOUL AIR adds more to your costs...

. . . than the blower that helps men do a fair day's work

Speed fresh, cool air into a furnace, manhole, tank or other confined area where men must work and you'll get faster, better work in return.

There's a portable, easily adaptable Coppus Blower or Exhauster for just about any problem caused by stagnant, hot or fume-filled air. The Blue Ribbon stands for precision engineering that assures peak performance at lowest cost. Check and mail the coupon today for the information that fits your particular problem. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG, BEST'S SAFETY DIRECTORY, MINING CATALOGS.

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"BLUE RIBBON"
PRODUCTS

HORIZONTAL TURBINE
Six frame sizes —
1 to 150 horsepower

VERTICAL TURBINE
Six frame sizes —
1 to 150 horsepower

FANMIX GAS BURNER

FANMIX OIL BURNER

MAIL THIS COUPON To Coppus Engineering Corp., 101 Park Avenue, Worcester 2, Mass.

PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fusilages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets; etc., after treated with coating material.

NAME .....

COMPANY .....

ADDRESS .....

CITY .....

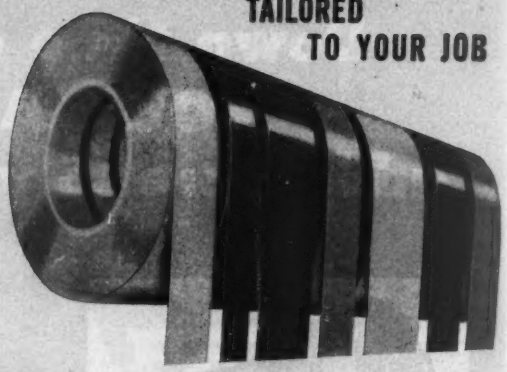
(Write here any special ventilating problem you may have.)

THE NEW

Polyken®

INDUSTRIAL TAPES

TAILORED TO YOUR JOB



How to wrap an oil "divining rod"—The "divining rod" used by the Magnolia Petroleum Co. is this electrical cable, which, by picking up and recording seismic waves, helps probe the earth for new oil fields. Protecting it from the abrasion of rough ground was a major problem until *Polyken* No. 163 tape was recommended as a tough, durable and economical wrapping.

Industry is finding "money" in every roll of our tape

Who'd ever have thought that industry would find so many important savings from *tape!* It's happened because *Polyken* doesn't just look for jobs that tape will fit. We build tapes to fit jobs. Stronger, tougher, *cloth*-backed tapes, most of them—at no more cost than other tapes.

So confident are we that *Polyken* Tapes can cut production costs for you that we make this challenge: Let us study your operation and we'll save you money, time or effort!

Think for a moment and you'll realize how many jobs you have now that tape could do better—*if* there were a tape made for that job. Chances are we have it. So take us up on our challenge. We don't think we'll lose. And we know *you* won't!

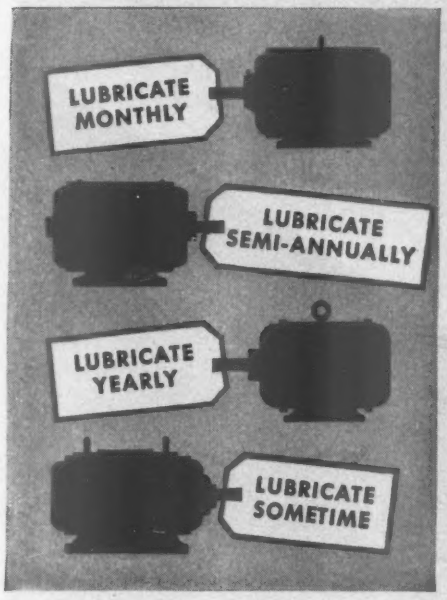
FREE BOOKLET

To choose the tape tailored for your job, write for your free copy of "Test It Yourself." Address *Polyken*, Dept. **FMA**, 222 W. Adams St., Chicago 6, Ill., or see your *Polyken* distributor.

***Polyken* Industrial Tape, Department of Bauer & Black, Division of The Kendall Company**

YOU CAN BE SURE.. IF IT'S

Westinghouse



Why take a chance with "Once-in-a-while" lubrication?

Why fuss with motors that require lubrication "every so often?" Whether it's monthly, yearly, every two or three years, or just an indefinite "sometime," it is as much trouble remembering when to lubricate, as it is to do the lubricating. And it certainly isn't a very good way of making sure bearings get proper greasing attention.

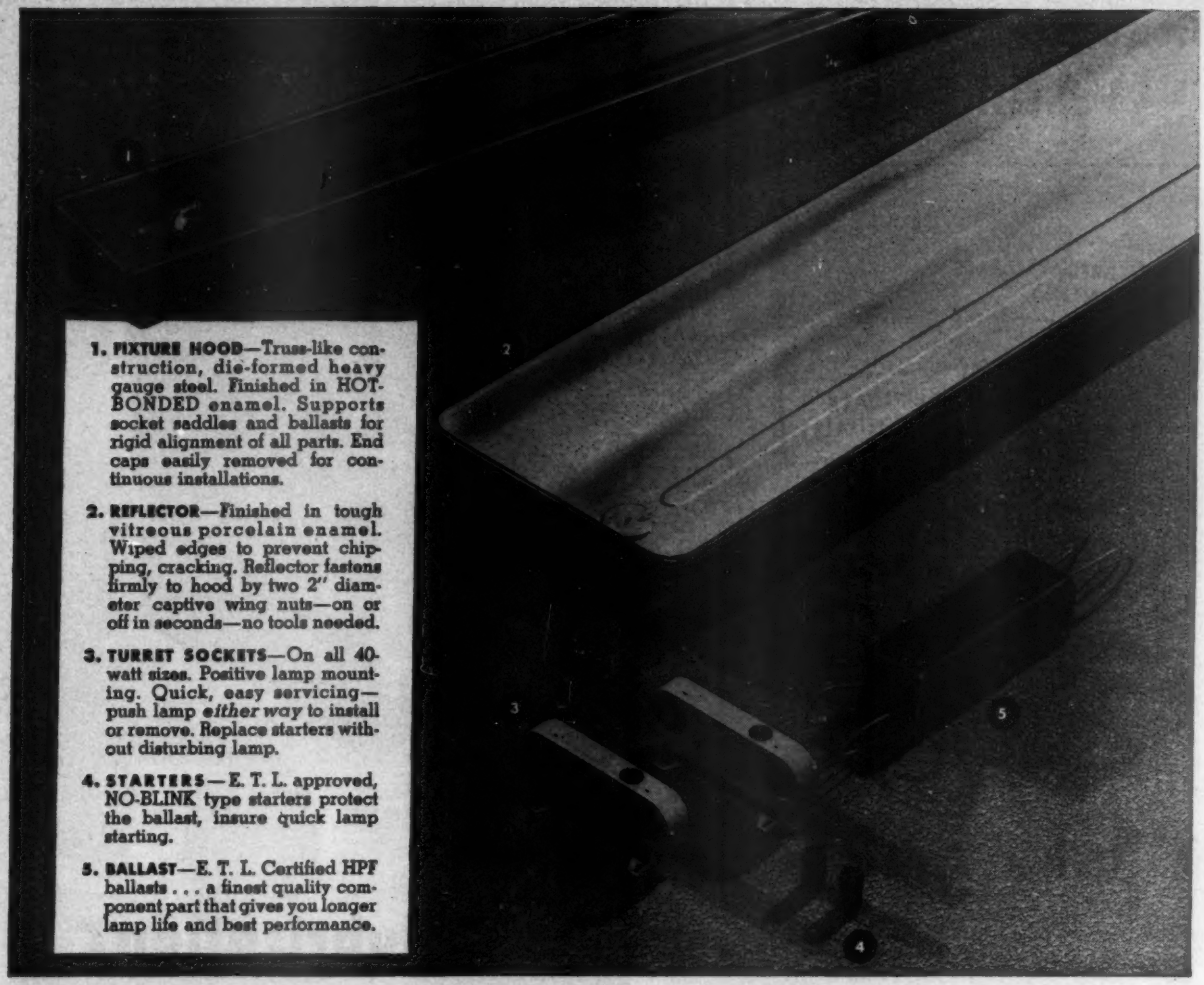
There *is* one way to be *sure*. That's with Life-Line motors. Lubrication is *positive*. Bearings are pre-lubricated and factory-sealed. *No* further lubrication is required!

This is the modern way of lubricating motors. Development of special lubricants, up-to-date manufacturing methods and special seals have made it possible.

Records of nearly half a million motors, operating in every type of industry, indicate that pre-lubricated bearings offer: an average saving of $2.70 yearly per motor . . . 41% fewer motor outages due to faulty lubrication . . . complete freedom from lubrication attention.

Today, periodic lubrication is a costly nuisance. So why take a chance with it when Life-Line offers positive lubrication at no extra cost. See for yourself. Ask your Westinghouse representative for a copy of "Facts on Pre-Lubricated Bearings," B-4378, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21559

—— *If you figure LIFE-COSTS . . . you'll figure LIFE-LINE* ——



1. **FIXTURE HOOD**—Truss-like construction, die-formed heavy gauge steel. Finished in HOT-BONDED enamel. Supports socket saddles and ballasts for rigid alignment of all parts. End caps easily removed for continuous installations.

2. **REFLECTOR**—Finished in tough vitreous porcelain enamel. Wiped edges to prevent chipping, cracking. Reflector fastens firmly to hood by two 2" diameter captive wing nuts—on or off in seconds—no tools needed.

3. **TURRET SOCKETS**—On all 40-watt sizes. Positive lamp mounting. Quick, easy servicing—push lamp *either way* to install or remove. Replace starters without disturbing lamp.

4. **STARTERS**—E. T. L. approved, NO-BLINK type starters protect the ballast, insure quick lamp starting.

5. **BALLAST**—E. T. L. Certified HPF ballasts . . . a finest quality component part that gives you longer lamp life and best performance.

THE DAY-BRITE "DAY-LINE" PUTS ITS PARTS ON THE TABLE

Judge a book by its cover? Judge a lighting fixture by its appearance alone? No! Not if you want to be sure, *dead sure,* that the fixture you select will give you years of trouble-free, economical performance.

It's insides — *quality insides* — plus expert engineering, sturdy construction, durable finish and low-cost maintenance features that make the "Day-Line" such an outstanding value. Be sure! Compare the "Day-Line" with any other fixture in your own "take-it-apart" test. See for yourself how every inch of the "Day-Line" is quality-built — *inside and outside*—to give you *real* economy through long, efficient service.

Day-Brite Lighting, Inc., 5441 Bulwer Ave., St. Louis 7, Missouri. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ontario. Distributed nationally by leading electrical wholesalers.

Available for two 40-watt lamps, three 40-watt lamps and two 85-watt lamps. Open or closed end reflectors. Single unit or continuous installation.

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

Premium Quality Without Premium Cost

015

the ZIP saves *my* time *your* money

That's the big thing about this little hoist!

Skilled workers should never be allowed to heave heavy loads by hand. Let them put their time and effort where they belong—in production.

In thousands of plants "thru-the-air" handling with the Zip-Lift is saving time—earning money... beside machine tools, along assembly lines, around loading docks, receiving rooms, warehouses—wherever the handling of loads up to 2,000 pounds can be turned into a push button job.

What are your chances for making money with the Zip-Lift? Any P&H Representative will show you where—and how—and how much profit it will earn for you.

Meanwhile, bulletin H20-4 may help you. It's filled with money-saving ideas. Write for it. Use the coupon below.

P&H ZIP-LIFT

Handle it "thru-the-air" at lower cost

These added values make the P&H Zip-Lift

America's most popular little wire rope electric hoist

SAFER — 110 volt push-button control. No open wiring. Plugging type limit switch; double brakes.

LIFETIME CONSTRUCTION — Precision built — shaved gears running in oil — grease-sealed antifriction bearings — fully enclosed, moisture-proof, dust-proof, acid-proof. Motor designed for hoist service.

ALERT SERVICE — Out-of-stock delivery from qualified dealers everywhere — also backed by 19 branch offices and conveniently located warehouses.

And Now . . . Still More New Features — All Standard Equipment

- Lower limit stop — meets all safety codes.
- Extra ground conductor in feeder cable and push button pendant.
- Reinforced push-button pendant.
- Grooved drum for longer cable life.

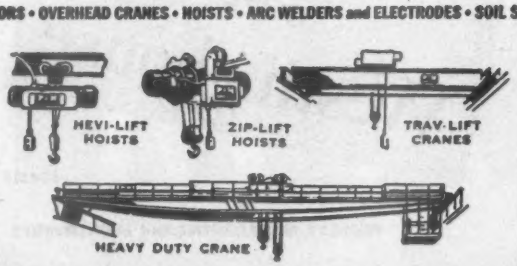
Available in capacities up to 2000 lbs.

P&H **ELECTRIC HOISTS**

4525 W. National Ave.
Milwaukee 14, Wis.

HARNISCHFEGER

EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS and ELECTRODES • SOIL STABILIZER • CRAWLER and TRUCK CRANES • DIESEL ENGINES • CANE LOADERS • PRE-ASSEMBLED HOMES



HARNISCHFEGER CORPORATION
4525 W. National Ave., Milwaukee 14, Wis.

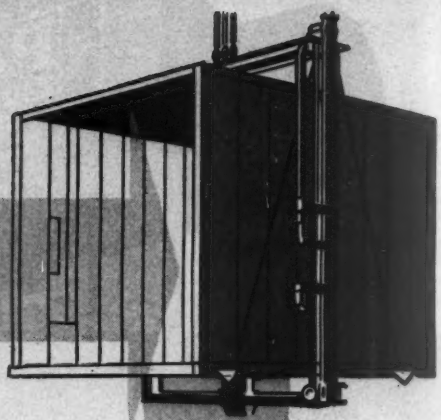
Gentlemen: Please send me your Bulletin H20-4 on the Zip-Lift.

Name.....

Company.....

Address.....

City.....Zone.....State.....



TURNING POINT IN EFFICIENT MATERIALS HANDLING... WHERE HORIZONTAL CHANGES TO VERTICAL

On every floor of your plant you move products on hand trucks, power trucks and conveyors. But horizontal materials handling is only one factor in your operation.

When you move your products vertically, your freight elevators have entered the picture. This is the turning point in your materials handling system.

Westinghouse can help you plan cost-cutting freight elevator installations . . . help you integrate the horizontal and vertical to achieve the most efficient methods in materials handling for your plant. In our book, "The Buyers' Guide for Freight Elevators" you'll find the most complete source of information available on the selection and application of freight elevators. Write on your letterhead to Elevator Division, Westinghouse Electric Corp., Dept. M, Jersey City, N. J.

WESTINGHOUSE FREIGHT ELEVATORS

YOU CAN BE SURE...
IF IT'S
Westinghouse

J-98585

COMPLETE *Finishing* SYSTEMS

for ENAMEL • LACQUER • PAINT

Mahon Cleaning and Rust Proofing Equipment in Two Automobile Body Finishing Production Lines.

. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!

Mahon Down-draft Hydro-Filter Spray Booths in Two Automobile Body Painting Production Lines—Part of a Complete Mahon Finishing System.

Interior of the New Mahon Down-draft Hydro-Filter Spray Booth with the New "Hydraire" Flood Sheets.

Typical Mahon Direct Gas-Fired Drying and Baking Ovens in Two Automobile Body Finishing Lines.

Modern Equipment Produces Finer Finish . . . Makes for Better Working Conditions!

The equipment illustrated here is part of a complete automotive finishing system recently installed by the Mahon Company in one of the large automobile plants . . . it embodies many new features which make for reduced maintenance, better working conditions, and finer finishes at minimum cost. In the automotive field, as in the household appliance field, and any other industry where finishing constitutes a major production operation, you will find more complete Mahon finishing systems than all other types combined. Manufacturers, today, turn their finishing problems over to Mahon with complete confidence . . . they do so because they know that the Mahon organization has pioneered development in this highly specialized field for over thirty years . . . they know, also, that broad experience and constant research and experimentation have endowed Mahon engineers with a wealth of technical knowledge and practical know-how not available elsewhere. See Mahon's Insert in Sweet's Mechanical Industries File for complete information, or write for Catalog A-650.

THE R. C. MAHON COMPANY

HOME OFFICE and PLANT, Detroit 34, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning and Pickling Equipment, Metal Cleaning and Rust Proofing Equipment, Dry-Off Ovens, Hydro-Filter Spray Booths, Filtered Air Supply Systems, and Drying and Baking Ovens; Core Ovens, Dust Collecting Systems, Fog-Filters, and many other Units of Special Equipment.

MAHON

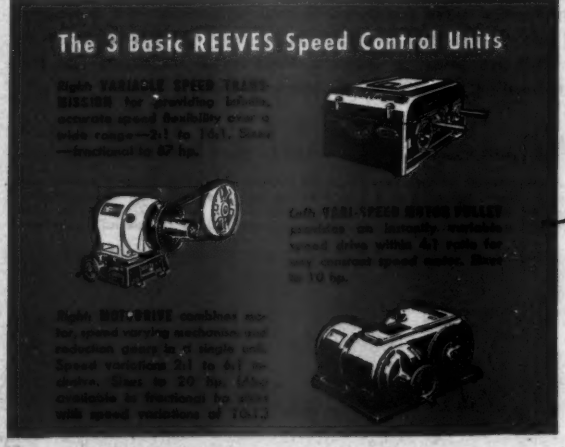
Example: Close Control of Conveyor Speeds

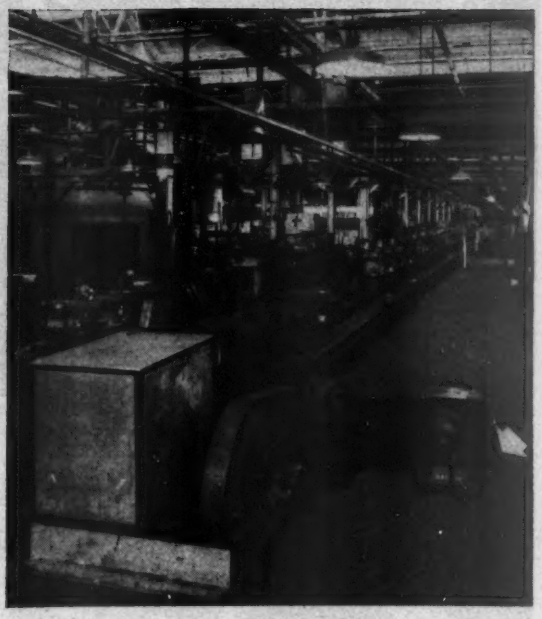
If you have a wrinkle in your flow of production, *smooth it out* by applying REEVES Speed Control to the conveyors in your plant.

With accurate, positive REEVES on the job, conveyor speeds are instantly adjustable, within a fraction of an inch per minute, to the *exact* speed desired. Speed changes are made while the conveyor is in operation, without stops for costly belt or pulley changes. A mere turn of a handwheel or touch of a button delivers the right speed for every operation and every operator under every changing condition . . . prevents delays, lost motion, congestion or idleness caused by over-supply at certain points and under-supply at other points.

To assure you of the unit best suited to your particular operations, REEVES makes a complete line of variable speed drives, built around the three basic units shown below. Each is available in a wide range of sizes, designs, capacities, speed ratios, and with your choice of manual, push button or completely automatic controls.

REEVES units have been proved in 265,000 installations in virtually every industry—are standard equipment on more than 2,100 different makes of machines. Apply REEVES Speed Control to the machines you now use—always specify REEVES for the new machines you buy. Write today for *all* the details. Ask for new 132-page Catalog F-50-3N.





This motor assembly conveyor, installed in one of the nation's large automobile manufacturing plants, is standardly equipped with a REEVES Motor Pulley by the maker, General Conveyors Corporation, Van Dyke, Mich. The instant, accurate speed variations available with REEVES compensate for differences in number and skills of operators on the assembly line; also compensate for variations in delivery of assembly parts at different stations along the line.

This is one more example, taken from many on file, showing how REEVES Speed Control regulates conveyor speeds—boosts production ceilings. For other cost-cutting functions performed by REEVES, see the listing below.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

accurate · variable
REEVES *Speed Control*

Other Uses:

Handle more shapes, sizes and materials • Match skills of operators • Compensate for changes in character of product in process • Maintain uniform peripheral speeds • Maintain uniform pressure, temperature, liquid level, etc. • Assure accurate timing • Synchronize parts of one machine or different machines operating in series.

A "New Dimension" in Railroading served by Georgia-Pacific

THE "REEFER" THAT HAULS WITH ITS SKIN!

...ANOTHER GPX ADVENTURE IN THE IMPOSSIBLE

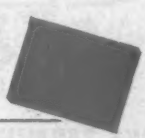
That's what railroad men are saying about UNICEL—the new refrigerator box car made of light, super-strong plywoods. Pressed Steel Car Company started with Georgia-Pacific GPX plastic-faced plywood and ended up with a revolutionary design in which the entire skin of the car—not just the "keel"—works in hauling the load.

Floor, sides and top are sheets of GPX, fused together with phenolic glues under pressure and electronic heat. Result—a stronger, lighter car that costs less to build.

GPX, which combines the strength and durability of plywood with the armor-hard surface properties of plastic, is just one of the "new dimensions" that Georgia-Pacific works into its products to serve American business.

Through a nationwide network of modern plants, warehouses and sales offices, Georgia-Pacific offers industry a new kind of service, a "new dimension" in plywood, lumber and door buying . . . geared to help you buy more efficiently and economically.

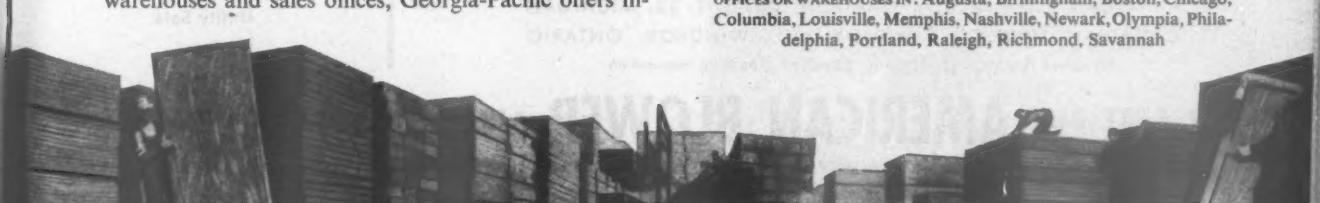
BUSINESS EXECUTIVES—*For a modern approach to plywood and lumber buying, write on your company letterhead for a copy of this 20-page full-color booklet—A "New Dimension," Georgia-Pacific Plywood & Lumber Company, 1231 Southern Finance Building, Augusta, Ga.*



GEORGIA—PACIFIC

PLYWOOD & LUMBER CO.

OFFICES OR WAREHOUSES IN: Augusta, Birmingham, Boston, Chicago, Columbia, Louisville, Memphis, Nashville, Newark, Olympia, Philadelphia, Portland, Raleigh, Richmond, Savannah



DOUGLAS FIR PLYWOOD • HARDWOOD PLYWOOD • GPX • SOUTHERN & WESTERN LUMBER • DOORS

American Blower . . . a time-honored name in air handling

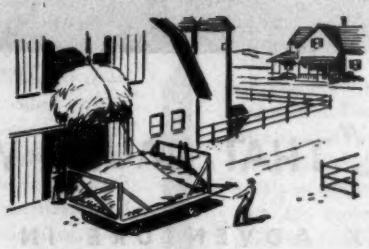
Philadelphia* is another city with a conveniently located American Blower branch office to provide you with data and equipment for air handling. You can reach American Blower in Philadelphia by calling Rittenhouse 6-6393. In other cities, consult your phone book.

BANKS PROFIT . . .

Banks have a way of keeping their customers' comfort well in hand. Many have found American Blower Fans and Capillary Air Washers keep air refreshingly clean and customers and employees delightfully cool. Using fans and air washing equipment as a combined unit is a highly effective method of providing comfort cooling, yet its cost is surprisingly low. If you're interested in similar equipment for your business, call our nearest branch office.

BUS TERMINALS PROFIT . . .

Like any business, a big metropolitan bus terminal needs to maintain a pleasant atmosphere. And we're proud to report that one of the country's largest terminals recently ordered 85 American Blower Type A Conditioners. These reliable units are designed for summer cooling and dehumidifying and winter heating and humidifying. Type A Conditioners might prove an equally profitable investment for you since the advantage lies in being able to meet the climate conditions of any season with a single unit.

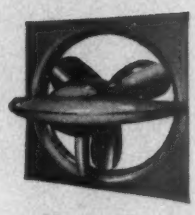


FARMERS PROFIT . . .

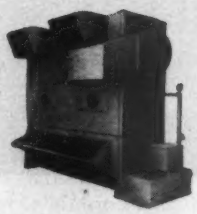
They put air to work down on the farm, too. Drying a big barnful of damp hay used to be a problem, but no longer. Enterprising farmers around the country use American Blower Hay Curing Fans to speed up drying time. More hay is cured, hence more dollars in profit. Our Bulletin 3205 will give you helpful information on hay curing fans.

*If you attend the Heating and Ventilating Exposition in Philadelphia, January 22-26, 1951, you are extended a cordial invitation to visit our exhibit in Booth A.

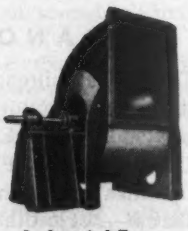
Unit Heaters



Ventura Fans



Air Conditioning Equipment



Industrial Fans

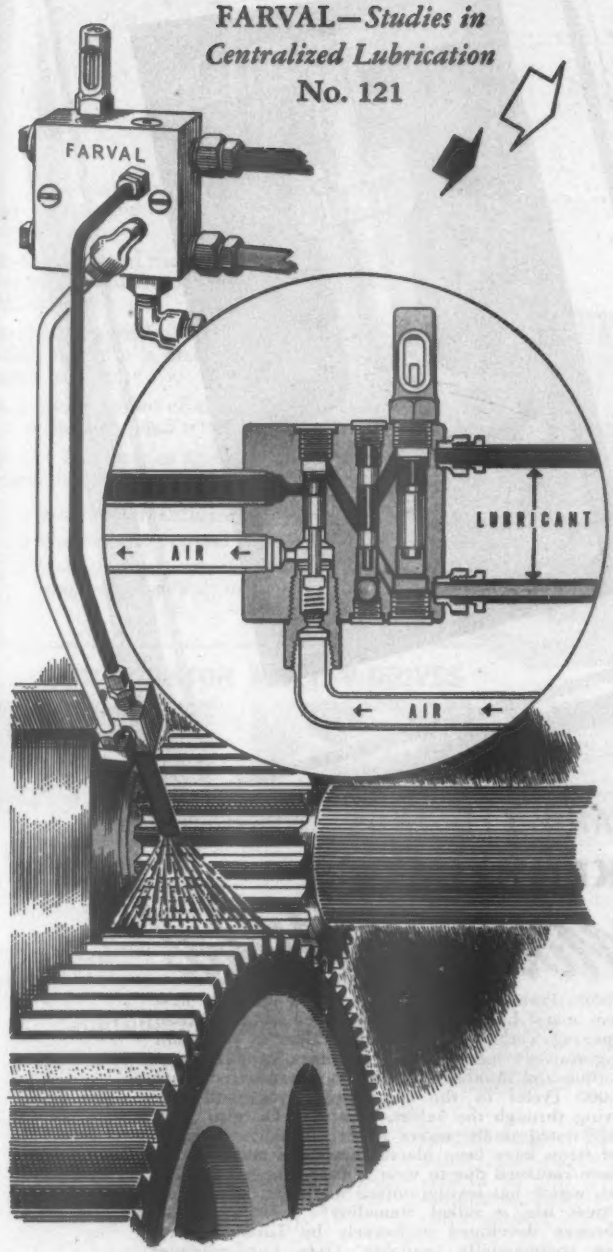
Utility Sets

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

YOUR BEST BUY AMERICAN BLOWER AIR HANDLING EQUIPMENT

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

FARVAL—*Studies in Centralized Lubrication* No. 121



New Farval Spray Valve

meters lubricants to slide surfaces and open gearing

CONTROLLED spraying of lubricant on open gearing, slide surfaces, etc., is practical with the new Farval Spray Valve.

By an ingenious adaptation of the familiar Farval Dualine Valve, either grease or oil is sprayed through a nozzle—on any desired area, in any desired amount, and at any desired interval. The new spray valve can be added at any point in a regular Farval Dualine System where compressed air is available—or a complete system may consist entirely of spray valves, served by either manual or automatic pumping unit.

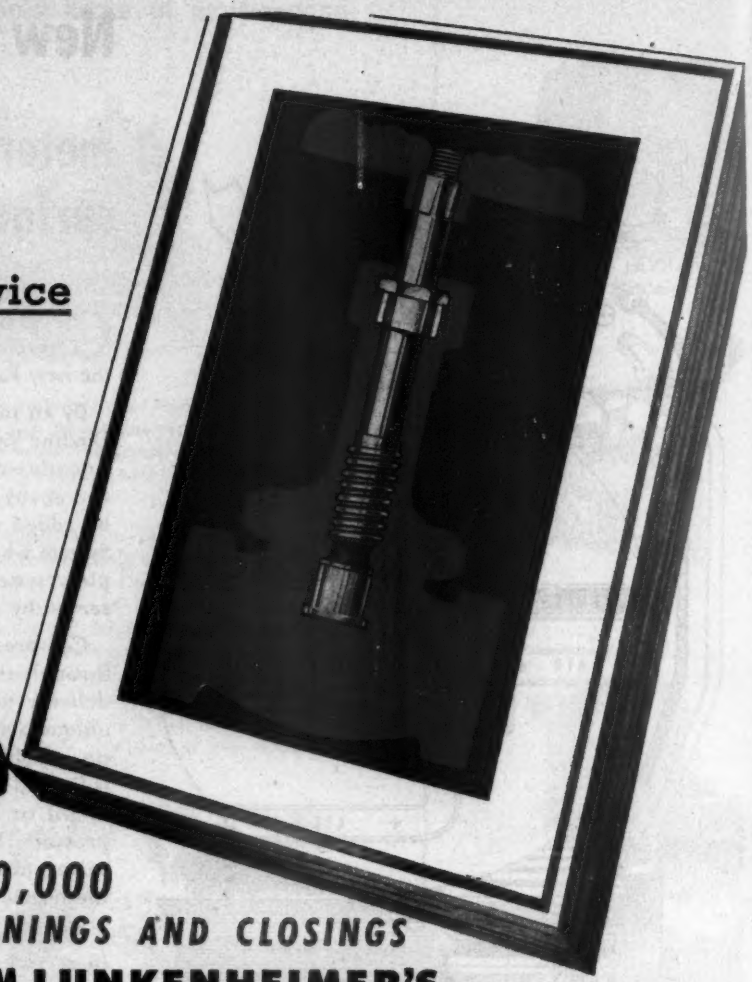
Compressed air from the supply line is directed through the spray valve, which meters air to the delivery nozzle just as lubricant is metered. By a unique arrangement, the lubricant valve also turns on and shuts off the air. Thus the quantity of air used is limited to the amount needed to spray each delivery of oil or grease, without exhausting or reducing pressure. Positive cut-off of lubricant by the Farval valve after each delivery eliminates bleeding from the nozzle—no waste, no mess, no trouble.

The Farval Spray Valve has been thoroughly tested in service and is now in use on a wide variety of machines and equipment. It has demonstrated its ability to supply lubricant efficiently and economically to open gearing, slide surfaces, in fact, wherever a standard Farval Dualine closed system is not readily adaptable.

Write for a copy of Farval Spray Valve Bulletin No. 60 for a full description, with illustrative diagrams and installation data. The Farval Corporation, 3256 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.

amazing bronze stem gives years of extra service



* Trade Mark Registered

300,000 OPENINGS AND CLOSINGS FROM LUNKENHEIMER'S *Miracle Metal*

Unbelievable? Perhaps, but Lunkenheimer's amazing new bronze stem metal has actually been tested at more than 300,000 openings and closings—the equivalent of years and years of rigorous service. Wear-test machines, carefully controlling torque and number of turns, have registered more than 300,000 cycles in the continuing tests—with live steam flowing through the valves. This stem has also been exhaustively tested under severe field conditions. Literally millions of stems have been placed in service, and not one has ever been returned due to wear failure. The remarkable stem metal, which has revolutionized all prior conceptions of valve stem life, is called Stemalloy*. It is a special-purpose bronze developed exclusively by Lunkenheimer, and is not commercially available. *Only Lunkenheimer valves* have the Stemalloy* stems. Ask your leading industrial distributor for information on the *complete* Lunkenheimer bronze valve line, or write The Lunkenheimer Co., Box 360L, Cincinnati 14, Ohio.

BRONZE • STEEL • IRON

LUNKENHEIMER

THE ONE *Great* NAME IN VALVES

Don't buy a V-Belt Drive unless–

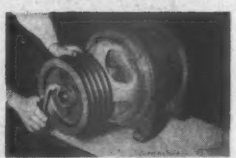
1. the sheave comes in two parts for easy mounting—separately or as one-piece assembly[a]
2. the hub and rim are "taper-mated", for friction cone grip and positive press fit on shaft[b]
3. the clamped hub holds shaft position when rim size is changed—no realignment problem[a]
4. I-beam spokes on driven sheave help carry heavier load with less weight[a]
5. the belt carries the load with minimum internal friction[c]

a Worthington exclusive
b Worthington original
c Worthington-Goodyear original—endless load-carrying cords in neutral axis

WORTHINGTON MULTI-V-DRIVES

Easy to get on

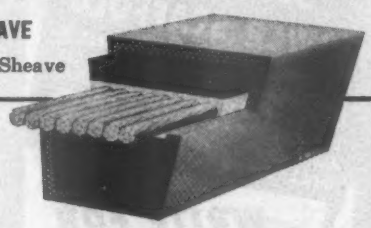
Easy to get off



Yet always tight on the shaft

WORTHINGTON QD SHEAVE

Original Tapered Cone-Grip Sheave



WORTHINGTON-GOODYEAR EC CORD V-BELTS

Each endless cord carries an equal share of the belt load—each belt, matched and uniform in length, carries an equal share of the drive load.

Send coupon for latest Worthington QD Sheave bulletin, V1400B7F

Complete Range of QD Stock Sizes— Prompt Shipment 853 listed stock sizes in "A", "B", "C", and "D" sections fhp to 600 hp... 332 listed stock sizes of EC Cord V-belts.

It was a crisis that occurs only on Saturday mornings

Minutes before noon on a Saturday morning, a frantic call to Oberjuerge Rubber Distributing Co., St. Louis, Mo. reported a motor failure at a brickyard.

A week's stoppage of production was threatened.

A different motor was available, but not the right rpm.

Could Oberjuerge furnish belts and sheaves to give the proper speed? Answer (after some quick calculations): yes—two Worthington QD Sheaves, 8 groove, 16 in. driver, 58 in. driven, with a set of 8 Worthington-Goodyear V-Belts.

By mid-afternoon, the brickyard was back in production. Again, a Worthington distributor had saved the day—or, in this case, a week!

WORTHINGTON

ORIGINATORS OF THE QD SHEAVE
WORTHINGTON PUMP AND MACHINERY CORPORATION
MULTI-V-DRIVE SALES DIVISION
Buffalo, N. Y. • General Offices: Harrison, N. J.

POWER TRANSMISSION: sheaves, V-belts, variable speed drives
PUMPS: centrifugal, power, rotary, steam
AIR COMPRESSORS: water-cooled, air-cooled

The Good Right Hand of Industry

Worthington Pump and Machinery Corp.
Multi-V-Drive Sales Division,
Buffalo, New York

Send Bulletin V1400B7F on Worthington Multi-V-Drives.

Name.....
Company.....
Address.....
City.....Zone....State.....

SAVE up to 70% with Aluminum Alloy "UP-RIGHT" SCAFFOLDS

NEW, FASTER, SAFER WAY TO GET UP IN THE AIR & ROLL WITH THE JOB

Industrial users everywhere report time and labor savings over old-fashioned methods. In fact, savings on even single jobs have more than covered the cost of the scaffolds. Indispensable for efficient painting, cleaning, relamping and overhead maintenance on machinery, walls, ceilings, piping, ventilating and heating installations in large or small plants. And NO scaffold except an "UP-RIGHT" is engineered to provide these advantages....

- **Lightweight. Aluminum alloy is stronger than structural steel yet one-third the weight.**
- **Patented one-piece sections with built-in stairway. Sections fold flat for easy storage.**
- **Built-in legs . . . *instantly adjustable* for rapid levelling on uneven floors or on stairways.**
- **Patented casters with single swivel-and-wheel lock.**
- **No rust.**
- **No wrenches, wing nuts, bolts or loose parts.**

30' Mobile TOWER SCAFFOLD

which took only 10 minutes to erect. A tower of any other height desired can be erected by using the required number of standard 6' or shorter sections. Each one-piece section is easily handled by one man.

ROLL-AROUND and SAFETY CAGE

Provides new, faster method for covering entire wall areas of tanks. Can be rigged by one man. Roll-Around is anchored to eye-bolt on top of tank. Safety cage is raised or lowered while rolling around.

WRITE FOR DESCRIPTIVE CIRCULAR

Mobile 6', 8' or 10' SPAN SCAFFOLDS

"The only way to get over looms and spinning frames," reports textile plant manager. "Ideal for narrow aisles and cluttered areas in any factory.

Before buying scaffolds insist on a demonstration . . . then buy the best—the one and only

"UP-RIGHT" SCAFFOLDS

DEPT. 104 • 1013 PARDEE ST. • BERKELEY, CALIF.
***Factories:* BERKELEY, CALIF. • TETERBORO, N. J.**

• OFFICES IN ALL PRINCIPAL CITIES •

How to MOVE MORE MATERIALS with less manpower, less equipment

—USE AN ALLIS-CHALMERS HD-5G TRACTOR AND INTERCHANGEABLE ATTACHMENTS

You can not only move more materials with this versatile combination, handling them safer and cheaper — but at the same time free several men to do other jobs. *One man* works with an HD-5G Tractor and one or more interchangeable Tracto-Shovel attachments to lift, load and carry big quantities of bulk or solid materials — inside or outside plants.

No need of a special machine, either, to handle each type of work. Just choose the attachments you need from the 14 available — and you can match the HD-5G exactly to the jobs to be done. Attachments are easily changed by the operator in but a few minutes — by simply removing four pins. Get all the facts on this most versatile tractor-loader ever built. See your Allis-Chalmers dealer or write for new literature.

In addition to handling a wide variety of materials, the HD-5G maintains yards and roads, spots cars, plows snow, is busy all year 'round.

Your choice of 14 Attachments—
all easily interchanged in a few minutes

TINE FORK is ideal for loose, bulky materials such as metal shavings, pea vines, etc.

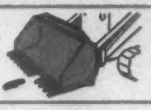
LIGHT MATERIALS BUCKET, big 2-yd. size, speeds loading and carrying of light materials such as snow, coke, coal, cinders.

LIFT FORK lifts, stacks or skids palletized loads, lumber, logs, pipe, etc. Lifting height (under fork) 106 in., capacity 4,000 lb.

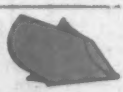
NARROW BUCKET has ¾-yd. capacity, is narrow and deep for working in tight places.

DRAG BUCKET is excellent for jobs such as unloading from ship hold—drags material from sides and corners into reach of clamshells.

STANDARD BUCKET feeds hoppers, stockpiles and reclaims materials of all kinds, handles countless digging and loading jobs. (1-yd.)



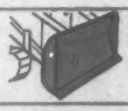
BUCKET TEETH attached to any bucket increase production as much as 30%.



SNOWPLOW knifes through heavy drifts, cleaning 116-in. path to keep plant drives open, traffic moving.

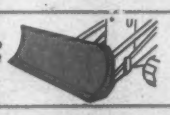
ROCK BUCKET is built extra strong, with reinforced sides and bottom, for digging and loading rock, brick paving, etc. (1-yd.)

ROCK FORK lifts heavy boulders, concrete blocks—screens out larger pieces from any aggregate.



BULLDOZER BLADE clears and levels land, grades roads, backfills, maintains dumps, handles any 'dozing job.

CRANE HOOK is for heavy-duty service—picks up and carries loads up to 5,000 lb. Loads and unloads freight cars, trucks. Lift height 138 in.



ANGLEDOZER may be tipped, tilted, angled right or left.

TRENCH HOE digs flat-bottomed ditch 27 in. wide, depths to 8 ft. Special buckets available to meet job requirements.

HD-5G weighs with standard bucket, 16,200 lb. — 40.25 drawbar hp.

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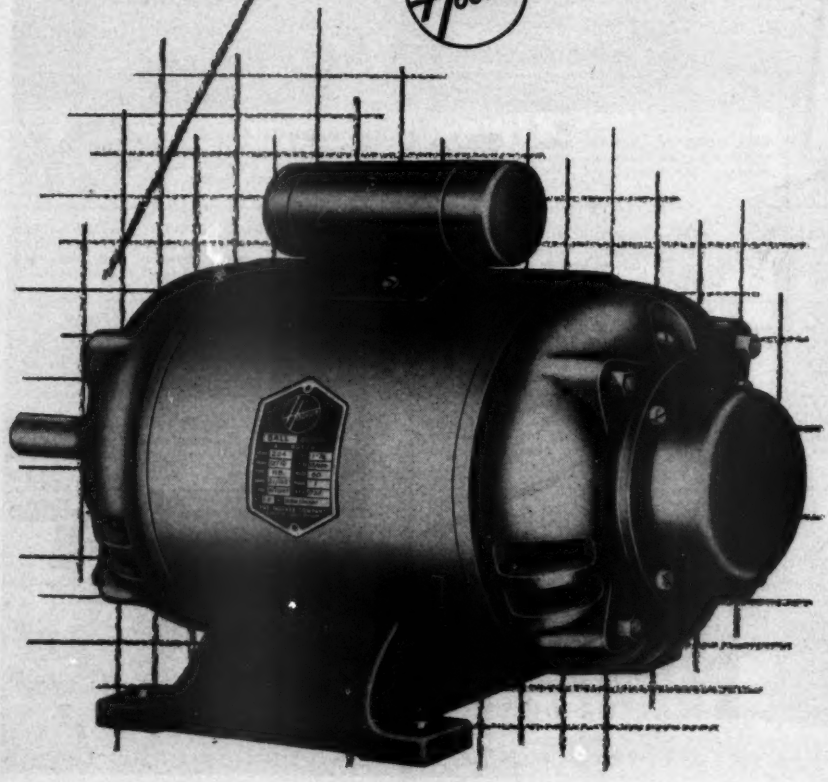

Hoover general-purpose motors are famous for long, quiet, dependable service. They're built like motors costing far, far more. And they come in three basic types to fit your requirements, whatever they are:

1. CAPACITOR-START MOTORS for hard-starting, continuous-duty applications such as compressors, machine tools, and pumps. Rigid or resilient mounted, sleeve or ball bearings, ¼ through 1 HP. Rigid mounted ball bearing only through 3 HP.

2. SPLIT-PHASE MOTORS for easy-starting, quick-to-accelerate applications such as fans, blowers, office equipment, light machine tools. High overload capacities. Sleeve or ball bearings, ¼ and ⅓ HP. Rigid or resilient mounted.

3. POLYPHASE MOTORS for use where three-phase supply lines are available. Start without reduced voltage compensator. Low-cost operation. Rigid mount or resilient mount, ball bearings, or sleeve bearing, ¼ through 1 HP. Rigid mounted ball bearing only through 5 HP.

Besides these general-purpose motors, there are other Hoover Motors designed especially for pumps, oil burners, fans and blowers. Write for details. Let Hoover Motors help hold your production curve to that good slant upward!

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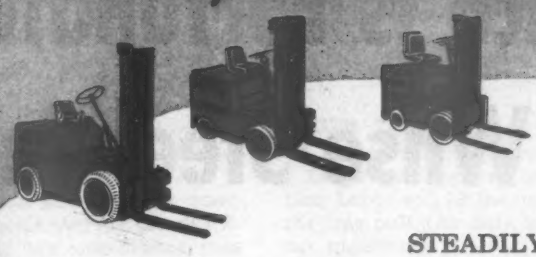
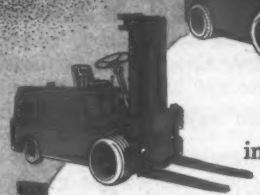




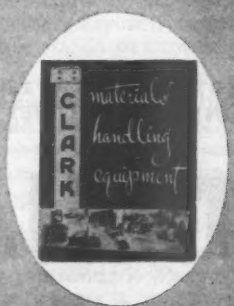
STEADILY RISING COSTS—growing user demands—imminent labor shortages! These very real conditions need not pose frightening problems to alert and able management.

Given proper machines, manpower can deliver a great deal *more* power—and enjoy doing it; more power that translates into greater production at lower cost.

Now that CLARK has added Powered Hand Trucks to its *Leadership Line* of Fork Lift Trucks and Industrial Towing Tractors, it is better fitted than ever before to help Management meet the challenges of a most critical era. For it is in the field of Materials Handling that the greatest opportunities for savings, for increased production, for improved efficiency and for the betterment of employee relations are to be found.

In every piece of CLARK materials-handling equipment, there is MORE POWER FOR MANPOWER. And it is yours to employ—yours to enjoy.

CLARK will exhibit at the Plant Maintenance Show, Cleveland, Ohio January 15-18, 1951.



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In national emergencies America is fortunate in having a well developed steel warehouse industry with facilities strategically placed throughout the nation—taking care of the day to day requirements of steel users.

As you know, the steel distributor serves as a collective source making steel quickly available to all industry—and thus reducing the need for larger individual inventories. In this way the greatest turnover is developed and a maximum tonnage is always in use.

Naturally only a portion of our country's production requirements can be served from warehouse stocks but very often top production can be maintained only through quick shipments of steel that is missing. The essentiality of these warehouse services has been proven again and again—in every national emergency.

Here at Ryerson, the Korean situation has naturally increased the demand for steel. Requirements, growing directly and indirectly out of the new conflict, are adding to the tremendous demand that has existed—almost entirely without let-up—since the beginning of World War II.

In spite of this increased pressure, we are making every effort to serve steel users promptly. In times like these, shortages are inevitable. But we do have a large though uneven stock on hand in our nation-wide steel service plants. So for any steel you need, contact your nearby Ryerson Plant. We'll do our level best to fill your order.

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What industry must do now about

DEFENSE MOBILIZATION

THE FIRST THING industry must do—where it has not done so already—is junk the idea that defense business can be handled on top of regular business.

The President's proclamation of a national emergency and simultaneous appointment of Charles E. Wilson of General Electric as top mobilization boss emphasize the urgency of recognizing this hard fact.

Wilson is a production man. He can be expected to give you every possible consideration—if you are producing military and civilian essentials. But he is going to demand that you toe the mark. You will be asked—even told—to produce more and more.

SECOND THING industry must do is get going fast on an aggressive program of materials conservation.

That does not mean just a program of scrap collection. A complete program can be summed up in the Five S's:

1. *Specification.* Starting all the way back at the design table, specify the minimum amount of material. If a tube can replace a rod, specify it. It uses less material. If a tolerance of 0.005 will work as well as 0.001, specify it. You'll have fewer rejects in meeting the more liberal tolerance, use less material (also less machine time and fewer man-hours). And specify original material to produce a minimum of machining scrap.

2. *Substitution.* There are more things you can do here than just use one material in place of another. Can you devise a miniature? Do so, it will save material. Can you extend the life of the product? Do so, sometimes even if it means using still scarcer materials; the cut in the total demand for number of units may justify it. Can you substitute a new production process?

3. *Simplification.* Can you eliminate parts by simplifying the product? It will save material. Is every part of the product necessary to assure proper functioning? Is there any ornamentation? Are tolerances or inspection standards unnecessarily tight? Ease them.

4. *Standardization.* Interchangeability of parts means less material tied up in inventory. Fewer sizes and models mean less materials tied up in inventories—both in originals and in spare parts. Standardization of parts, assemblies, specifications, and operations means greater familiarity with the work.

5. *Salvage.* Are you collecting every bit of scrap? Are you reusing as much of it as you can? Are you reprocessing it where you have the facilities? If you can't reuse it, are you selling it to someone who can use or reprocess it?

THIRD THING industry must do is get going fast on a program of manpower conservation.

Labor hoarding may help *you*, but it hurts the nation. Labor will be the nation's greatest shortage over the long pull. Our only hope of victory is to multiply our man-hours.

You'll find a lot of help on page 92 of the December issue and page 130 of this month's FACTORY.

Here are five *more* ways to conserve manpower by multiplying available man-hours:

1. *Apply work simplification.* Find the better, the quicker, the easier way to do every job. You'll get more net good units of product in the same number of man-hours with less physical strain on your workers. That will be increasingly important as we begin working longer hours.

2. *Reduce skill requirements.* "Division of labor" so that each worker needs fewer skills and less skill means more production per man-hour. It also means fewer days and weeks required for training.

3. *Service the skills you require.* Scarce toolmakers standing in line at the toolcrib are not helping either the national effort or your balance sheet. Don't let anyone do any job that can be done just as well by someone with less skill.

4. *Mechanize your operations.* If a machine can do the work as well as a man, try to get it. Sometimes you won't be able to, however, because the materials and man-hours needed to build the machine will have to be weighed against potential saving. But the rule is still good: *Where possible, mechanize.*

5. *Apply incentives.* Properly applied, a fair incentive plan will increase output per man-hour. But an unfair plan, or even a fair plan not properly applied, can be worse than no plan at all.

FOURTH THING industry must do is keep abreast of government mobilization plans, regulations, and controls relating to materials, manpower, procurement, and economic matters.

In this, FACTORY will help you. We will keep you posted on the highlights and the significance of government actions. And we'll tell you where you can get the details. The man we name won't always be the head of the bureau or agency involved; he will be the man immediately concerned—the man who can give you the best and fastest possible information or assistance.

The combined resources of FACTORY and the McGraw-Hill organization are available to help you—and through you the nation—in this emergency.

WHERE WE STAND TODAY...

... ON PRODUCTION MANPOWER. The labor situation is tight. But, despite increased draft calls, it's going to get better before it gets worse. *And it is going to get worse.*

Materials shortages are beginning to cause layoffs. As we double our military consumption and start converting plants in earnest, layoffs will increase. Labor will be extremely tight in spots during the first half of '51. But over-all we'll have an "apparent" surplus. That will make the draft appear fairly easy to take in stride. But when we really get rolling on military production late in '51, the pinch will come fast and be more severe than now seems possible.

... ON MILITARY PRODUCTION SCHEDULES. Top military people are now talking about a $60- or $70-billion arms program for fiscal 1952 (starting July, 1951). That's a 50% to 100% increase over previous estimates ($35- to $40-billions).

We may not get the "avalanche of contracts" some observers predict right after the start of the year, but there will be a major speed-up.

More important, there will no longer be a willingness to let industry convert to war production on a "reasonable" schedule. You are going to be pushed and pushed hard.

One big hold-up will be the fact that equipment is not available. "Phantom orders" for machine tools that could have been activated six months ago are still locked up in somebody's desk drawer. The machine tool stockpile will help, but it won't be enough.

... ON CIVILIAN PRODUCTION SCHEDULES. Despite increasing shortages and military production, the last quarter of 1950 may have set an all-time record for production of consumer goods.

Another six months will bring a different story. Limitation and even prohibition of specific end-products for civilians will start soon. The controlled materials plan to start in 1951 (see page 68) will mean no civilian production involving the controlled materials unless "programed" by the Office of Civilian Requirements.

A knotty problem involved in cutting schedules for civilian goods is retaining economies of mass production. The solution may lie in the type of device we worked out for alarm clocks and a few other items in World War II. Let one manufacturer satisfy the entire civilian requirement. But to keep him from gaining a competitive advantage, you forbid the use of his trade name.

... ON BASIC MATERIALS. Right now this is where we will feel the big pinch. Steel, copper, brass, and aluminum are all tight and getting tighter. The major cutbacks being planned in production for civilian consumption will ease the situation by the middle of the year. And, starting in 1952, planned expansion in steel and aluminum will begin to tell. But don't expect the expansion to keep pace with, much less overtake, increasing military demand.

Copper and brass present a darker picture. We can't get enough right now to keep all our mills working. Some are on 3- and 4-day weeks. For December, civilian requirements alone were estimated at 115% of total supply. Military requirements are not announced on a percentage basis. The rate of purchasing for the stockpile has been stepped up more than 50% in the past two months. Copper men estimate stockpile acquisitions represent the difference between present mill production and a 5-day week. That's 20% to 40% of the smelter output.

... ON CRITICAL MATERIALS. Relatively speaking, the *basic* materials are plentiful, possibly excepting such special forms as OFHC (oxygen-free, high-conductivity) copper for certain electronic applications. We are in real trouble when it comes to filling even military demand for such materials as columbium, cadmium, and cobalt.

... ON WAGE AND PRICE CONTROLS. The first price order was issued Dec. 16. More will follow, but on a selective basis for some time to come. Chances are any further "selective" controls will be applied in industries where labor contracts cannot be reopened for some time, and where industry-wide patterns prevail. Such wages can reasonably be considered "stabilized"—for a few minutes.

Nobody thinks "voluntary" price controls will keep the cost of living in check for long. The issue is going to have to be met squarely before the next wage raise becomes due under the escalator clauses.

... ON PRIORITIES. Only priority, as such, to date is the "single-band" DO rating, under which all priority orders receive equal treatment. It's OK for basic materials. But look at an item like cadmium: On Dec. 11, NPA had to announce that DO-rated orders alone for cadmium required more than total present supply. So all DO orders were directed to be filled only up to 50%. NPA said that if military requirements for more than 50% of an order were urgent, it would guarantee delivery by special directives. Directives take precedence over DO ratings. One NPA official says directives are being issued "by the hundreds."

This is an obvious signal that a system of preferential priorities—indicating by a grading system which orders come first—is on the way.

... ON STOCKPILE MATERIALS. Exact figures are not made public for security reasons. As of last July, about 40% of the objective was in inventory. Another 20% was on order for delivery by July, 1951. Official estimates were that to reach the objective by 1956 would require by then a total of $1.75-billion in additional funds.

It didn't get much publicity, but Truman's recent request for more stockpiling funds tells plenty: He asked $1.8-billion to spend between now and July, 1952. Even allowing for increases in prices and in objectives on some materials, that means the target date for completion of the stockpile has been moved ahead—probably to 1953, instead of 1956.

The acceleration in stockpiling will put a severe drain on some critical materials in the months ahead. Materials that are shortest are exactly the ones that will be needed most for the stockpile.

... **ON MACHINE TOOL STOCKPILE.** We now have about 65,000 machine tools, plus 45,000 miscellaneous motors, welders, trucks, cranes, etc., in the four stockpiles: Army, Navy, Air Force, and National Industrial Emergency Reserve. Defense contractors may "borrow" tools from the Service Reserves for specific jobs if tools are not available or if new ones would take too long to get. Approval of the procurement officer is required. Only the Services can borrow from the Emergency Reserve.

Not all tools in the stockpile are in perfect condition. It was found recently that acid in the dust at Gary, Ind., was eating the protective coatings. These tools are being moved to a dust-free location.

Furthermore, appropriations for processing tools when stockpiled were limited. The Army and Navy did as much processing as possible *on all tools.* The Air Force did a complete job on the first tools it acquired, then ran out of funds. So *some* tools in its reserve are imperfectly preserved; others are above stockpile average.

In reply to charges that tools from the stockpile are sub-grade, the Munitions Board says it was never the intention to stockpile either new or perfect tools, or to stockpile attachments and accessories. The objective was a reserve of "workable" tools, to be used only to break bottlenecks.

... **ON CONTRACT AWARDS.** The Dept. of Defense has ordered an immediate step-up in placing military contracts. The directive issued to procurement officers gives some tips on the things about your business you want to emphasize if you are seeking contracts:

1. *Effect the "greatest possible integration" of military orders with the mobilization schedules that 10,000 plants have held on a standby basis.* If your plant has a standby order, you're on the inside track if the military wants material comparable to that covered by the order.

2. *Make fullest possible use of small concerns.* You get an edge if you're a small company—and can prove that you are capable of handling the order.

3. *Utilize existing open industrial capacity to the maximum.* If NPA materials cutback orders have crimped your civilian operation, you probably qualify here.

4. *Use past competitive bid awards as a basis of negotiation.* If you have been a low bidder in the past, emphasize it.

5. *Require or "aggressively encourage" subcontracting.* Particularly if you're a big company, stress the fact that you have completed at least tentative arrangements for subcontracting much of the work to smaller companies.

6. *Consider available transport facilities in placing contracts.* If you have good transport arrangements —especially if alternate means are available in case of failure of prime outlets—it's a real asset.

7. *Consider the availability of manpower in the area.* If your area has a surplus of manpower, even temporary, you have an edge—if you remind the military of this fact.

8. *Reserve special skills of various firms for the harder jobs.* You'll get special consideration if you are particularly well equipped in terms of skill to handle a job. But you'll be discouraged from taking on a job that doesn't utilize your skills.

NPA ANSWERS THE QUESTIONS INDUSTRY IS ASKING

The National Production Authority's mail shows that certain questions are asked repeatedly. Both NPA and FACTORY want to save you the time and trouble of writing NPA if these "repeater" questions are in your mind, too. So the Authority made a sampling to find which questions are most often asked. We have talked with more than a dozen NPA officials to get NPA's answers to these questions:

1. What will be the speed-up in application of controls by NPA as a result of the President's declaration of a National Emergency?

NPA: Our pattern of controls is geared to both short- and long-range requirements of the military establishment, not to day-by-day changes in the military situation overseas. We are applying controls, as needed, *first* to guarantee materials for military production and *then* to assure fair distribution of what remains for civilian production.

As increasing military demands take a larger proportion of our total output, it is clear that more detailed controls will be needed.

2. Why hasn't NPA limited production of nonessential end-products, as the War Production Board did during World War II?

NPA: We have already done so in one case. We have stopped construction of recreation places.

More on next page

By reducing everyone to a certain percentage use of a material, we have cut back on the total production of end-items without being too hard on any one company or group of companies.

But as more military orders are released, we can apply more controls to nonessential end-products where needed—because the makers can switch to defense goods.

3. What civilian products and industries are considered essential? Who decides?

NPA: The problem is under study by all of our industry divisions and the Office of Civilian Requirements. Even their findings will be reviewed by industry advisory committees before final action is taken.

4. What is a controlled materials plan, and how does it work?

NPA: It is a plan under which a single agency allocates 100% of certain basic materials for specific end-uses, both military and civilian.

(See page 68 for FACTORY's analysis of how the Controlled Materials Plan worked in World War II and what you should do to get ready for a new CMP.)

5. How can I find out if I am entitled to a "hardship" exemption from a cutback order?

NPA: So-called "hardship" cases are handled on an individual basis. We will examine each to see just how much hardship a cutback order has caused and weigh that in relation to the current situation on the material involved.

First you write to NPA, giving the number of the NPA order affecting your situation. The division will make a recommendation on your request for adjustment. An appeals board within NPA will pass on all recommendations.

Obviously, we can't make adjustments every time there is some inconvenience. But our purpose is to keep industry working. A company that has been forced to shut down does not contribute to the national effort, and we will make every attempt to prevent shutdowns or other serious hardship.

6. Can NPA help me to expand?

NPA: We can help you get materials needed to expand production—if such expansion appears to be in the national interest. In addition, we can recommend to the National Security Resources Board that you be given a "certificate of necessity" which will entitle you to make a quick write-off of your new facilities for tax purposes. And we can recommend to the Reconstruction Finance Corporation that you be considered for financial assistance.

7. What is a DO rating or priority, and how does it work?

NPA: "DO" means defense order. It is a designation giving a defense order priority over other orders. Each DO-rated order carries two numbers. For example, DO-01. These numbers identify the procurement program and class of material. You do not give preference on one rated order over another according to the numerical designation. All DO orders receive equal treatment. You are to fill rated orders in the sequence in which you receive them, unless otherwise directed by NPA. You may "extend" a DO (that is, take it to suppliers) to acquire or replace material you use on a rated order or to purchase parts and sub-assemblies you need to fill a rated order.

9. I've been hearing about directives. How do they differ from DO ratings?

NPA: A directive (or an authorization) takes precedence over a DO rating. But unlike a DO rating, it may not be "extended" unless it contains special provision for extension.

10. Can I get a DO rating for capital equipment—machine tools and the like?

NPA: If the circumstances justify, we can help by authorizing a procurement officer to assign a DO rating (DO-98, for capital equipment) to your order. There are two essential steps: Fill out form NPAF-2. Send it to the procurement officer handling the contract which requires the equipment. Do not send the form to NPA. NPA has delegated authority to the procurement officer.

11. Can I get a priority for maintenance, repair, and operating supplies?

NPA: No. Regulation 2 says your maintenance, repair, and operating supplies (MRO) may not be rated. But the Armed Forces may apply DO ratings to the production of their own MRO requirements.

(FACTORY understands that some procurement officers are applying DO-98—the capital equipment rating—to orders for industry's MRO. NPA says it has no direct knowledge of this, but that it is contrary to Regulation 2.)

12. What should I do if someone refuses to accept an order to which I have applied a DO number?

NPA: Unless you are satisfied that the manufacturer cannot handle the order, you should notify the compliance division of NPA at the nearest field office of the Department of Commerce. Using the field offices will save you time and expense of needless contacts with Washington.

13. Can I get materials from the government stockpile to use on defense orders?

NPA: Control of the stockpile is a function of the Munitions Board.

(The latest report to Congress of the Munitions Board states the purpose of the stockpile: "It is not a first expedient but a last resort . . . to cover the most extreme wartime materials deficiencies.")

14. What inventory records must I keep? Will NPA furnish the reporting forms?

NPA: You need to keep only those records you normally maintain, including separate records of your usage of materials for DO-rated and nonrated orders.

NPA is going to ask you to file a minimum number of reports. We will follow the practice of using familiar forms whenever we can. Sometimes we will send you forms to file. Sometimes the basis of determining whether or not you should file may be the amount of material you use or have on hand. If you exceed a certain minimum, you are required to file. This is the case with respect to the steel, copper, tin, and rubber reports currently required.

Senator Lyndon Johnson, watchdog on preparedness, says:

We Must Plunge Even Faster Into All-Out Mobilization

Despite recent moves to boost military production, a lot of people are demanding a greater step-up right now—no matter what dislocations result, no matter how many men producing civilian goods are thrown out of work temporarily.

Senator Lyndon Johnson, Texas Democrat, is probably the most authoritative spokesman in the government (in Congress, at least) for that speed-up view. He is a first-term senator, but no freshman in the Capitol. He served 10 years in the House before moving over to the Senate in 1949.

What Senator Johnson thinks is significant—to industry and the general public. He's chairman of the Senate's special Armed Services Preparedness Committee—today's "Truman Committee." That's why, in an exclusive interview, FACTORY publishes his answers to 10 basic questions on mobilization.

•

1 · Has the time come to rush as fast as possible into *total* mobilization—to be ready for the worst?

Johnson: I believe that the time for total mobilization had come last July. That conviction remains unchanged. I can see no room for argument about the "degree" of mobilization; the odds against us are such that no effort short of total effort can assure us even a 50-50 chance in this struggle for survival. There is even less reason to debate the timing. Time is running out. Total mobilization cannot be accomplished overnight. We must go all-out, and with much more urgency. I am less afraid of doing too much, too soon, than of gambling with too little, too late.

2 · Has industrial mobilization gone ahead as fast as Congress expected when it passed increased military appropriations, beginning late last summer?

Johnson: I don't think so; certainly not so far as I am concerned. Increased appropriations were passed rapidly because the need for them was immediate. Now we find that in the five months after the Korean war began the Department of Defense has spent only about $1.2-billion more than in the five months prior to the outbreak of hostilities.

3 · Do we have to wait for the development of a so-called "strategic plan" before we can move faster to mobilize men and industry? Does the military now have a strategic plan? If not, what has delayed it?

Johnson: An over-all strategic plan is basic to any orderly mobilization. We have had plenty of time to evolve such a plan, and continued indecision is regrettable.

The military does not now have an acceptable plan. The most significant reasons for the lack of a plan are: (1) The failure of our military planners to acknowledge the obvious fact that the Korean aggression was clearly the beginning of a period of long-term danger, and (2) their apparent lack of concern about the weaknesses of our over-all position. We have tried to approach this struggle as though it were World War II all over again, when obviously it is not. It requires new planning, new thinking, new methods—and we have not had them.

4 · Are we inducting and training men for military service as fast as necessary?

Johnson: I do not think we are inducting and training men as fast as necessary. Because we haven't had camps ready, because we haven't had all the equipment we need, we have been putting off doing

what is obviously necessary. This situation is intolerable. An overwhelming proportion of our fighting strength was committed in Korea. Communist China's war against our troops there seriously decimated the strength of many units. Unless we step up induction and training of troops faster than the present schedule, even with the recent acceleration, we may find ourselves with less strength next June than we had last June.

5 · Do you think rigid controls on such things as materials, allocations, prices, and wages should be imposed now?

Johnson: I certainly do. The question of turning out nonessential goods or giving the fighting troops what they must have is not even debatable—so long as our production capacity is not big enough to produce both.

I thought price controls should have been imposed last summer. They were not. Now our price indexes are reaching new highs—the highest in our history. We cannot let this continue. It not only cripples the buying power of individual citizens; it also plays hob with the buying power of the government. Higher prices are eating up our tax dollars. That must end. Nothing less than rigid controls can do the job.

6 · What serious shortages that the public will feel are most likely to develop?

Johnson As far as I can see, the first serious shortages are most likely to be felt in rubber products, aluminum goods, steel goods, and, of course, radio and TV sets.

7 · Industry expects, and is prepared for, increased taxes to cover heavy military spending. But what government activities should be suspended for the duration to reduce expenses?

Johnson: We might well make substantial cuts in such activities as health, public works, public buildings, roads.

There can be no real justification for expanding every government agency during the emergency. We don't have the money resources to support unlimited big government—and we don't have the manpower to waste. This is a very real problem. It must be dealt with boldly, even if some decisions do seem to be harsh.

8 · What should be done in the emergency with known Communists and Communist sympathizers in the United States? What should industry do about those on its payrolls?

Johnson: The Communist Control Act, which Congress passed earlier this year, should be rigidly and effectively enforced. For industry—as for the nation as a whole—I would say that we must be extremely cautious without becoming extremely crazy. Within recent years, the public has had a liberal education concerning Communist methods. This sort of information is extremely effective in neutralizing whatever threat internal Communism might hope to present.

9 · Should our primary aim be to challenge Communism in Asia, or in Europe?

Johnson: This war in which we find ourselves cannot be divided into two parts. But we can't do everything at once. We aren't that strong.

Since this is likely to be a long, long war—the longest we have ever known—we must take into account the limitations of our resources and our manpower and use them prudently to assure ourselves of ultimate, if not immediate, triumph. We must decide not only where we *should* fight, but where we *can* fight and when.

Obviously, there may be some areas in which action by us would have a greater chance to succeed—both in Asia and in Europe. We must avoid hasty commitments to areas where the chances for success are hopeless.

10 · How, in your opinion, could America seize the initiative in the world struggle—or must that lie with the Russians?

Johnson: We must first recognize that the world struggle has passed beyond the political stage. We won that phase of it—in Europe, at least— when our aid programs triumphed over the Communist political programs.

Now, however, we are clearly in the stage when physical strength is decisive. In other words, we are in a shooting war. Nothing aids our cause more than battlefield victory; nothing detracts from our cause more than defeat. As a consequence, we must make the decisions as to where our strength may be most effectively committed—not let Russia make them for us. We must make clear to the world that we intend to defeat Communism everywhere eventually and that, to do so, we are going to fight where we can best fight and when we can hope for success. It aids the Communists for us to have no plan and to be careless—from outward appearances, at least—in our battle commitments and battle strategy. The world is not likely to support a nation which seems to be throwing away its strength.

Beyond this, however, we must undertake full mobilization. We must put our whole system, not just part of it, to work toward victory. The world has great respect for the power of our system when it is fully at work. But, faced as we are with Communism's total mobilization, we cannot hope to regain the initiative as a world leader with less than total mobilization ourselves. In a war—and that's what we are in now—the initiative rests with the strong. We can gain the initiative as we gain strength. That is a very simple formula, but no fancier formula can succeed at less expense. We cannot hold the initiative until we hold superior strength.

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

Coming: A "big auto formula" to control wages. A new Little Steel formula. Within months it will apply to most industries.

March is the target date. That's when a million workers will be due for higher wages under the General Motors cost-of-living escalator clause. That's when John L. Lewis will be putting the arm on coal operators for more pay starting April 1.

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What will the "big auto formula" look like? We can't be sure, of course. But this is how government wage stabilizers are thinking:

- Workers should not be denied higher wages based on rising living costs. Allow increases to keep up with the BLS consumer price index. But bear down on price controls—maybe with some subsidies—so that escalator clauses won't bring much in higher wages.
- Find some way to hold off the 4-cent annual improvement increase promised over the next four years. This is based on improved productivity.

Actually, productivity won't rise much, if at all, as we convert to war production. Or later, with longer hours, more women, older workers, etc.

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Living costs will rise faster in the next six months. Faster than since Korea. That's why many unions rush to get escalator clauses in their contracts. And why labor insists that wages be allowed to rise with the price trend.

Some employers, too, find escalator clauses desirable. Reasons: They remove wages—major strike cause—from dispute. They prevent a wage disadvantage in competing for manpower.

Philip Murray didn't want wages tied to living costs. (Nor will John L. Lewis.) But his 16-cent boost in steel put him ahead of other unions.

Wage controllers will agree to tie wages to living costs. But they won't let the annual 4-cent productivity boosts stand.

UAW-CIO's Walter Reuther is willing to do this: Defer payment of the 4-cent increase until some future date when inflation forces subside. Reuther carries weight in Washington.

Tying wages to living costs means controlled inflation, of course. The plan can be killed if:

- Mobilizer Charles E. Wilson cracks down, decides we must "hold the line." Remember Byrnes did it back in April, 1943.
- We get into all-out war.

Reuther has warned the government not to upset the GM-type wage clauses. If it does, he will consider the five-year contracts invalidated. That means new negotiations, maybe strikes. Other unions take the same dim view.

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How to prevent strikes against wage controls puzzles the Wage Stabilization Board. It would like to see another no-strike pledge. But, short of war, labor won't give it.

WSB also thinks it should settle labor disputes—as the War Labor Board did. It doesn't like being just an adviser to Alan Valentine on wage controls. Steps in this direction will come soon.

•

Whether, and when, to call a labor-management conference, worries the White House. It wants to be sure of a no-strike pledge before acting. But a formal conference isn't necessary.

Eric Johnston wants to organize a small, top-brass labor-management committee. It would look at current economic problems. Try to agree on steps to cope with them. That's behind the "secret" meetings you read about. A no-strike pledge, if considered, would be only incidental.

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Labor wants, and will get, a bigger role in our mobilization. Union leaders want more than advisory posts. They want to help make policy. And they want to administer it.

Truman is hearing about this through the 14-man United Labor Policy Committee. He is sympathetic to the idea.

So you will see a lot more of what happened when the Defense Transport Administration sought a director for its Manpower Division. The White House sent over three names. They were all union men. P. L. (Roy) Siemiller, Machinists Union vice president, got the $13,000 job.

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

The speeded-up mobilization program will convert most of metalworking to defense—this year. The impact is concentrated on the metal-producing and metal-using industries.

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As it looks now, the U.S. will be spending for defense at the rate of $50-billion a year—or more by the end of 1951. Then defense will take roughly 15% of total production of goods and services.

But the call on metalworking will be far higher. The military budget concentrates on "hardware"—munitions and equipment made of metal. By year's end, more than half the spending will be devoted to metal products.

That means the military will be asking for $25-billion to $30-billion of production from industries whose total output is now about $65-billion.

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What's more, much of that production is essential, can't be cut back much. Output of machinery, transportation, equipment, and other capital goods for industry will stay high. Metalworking products going into essential exports and priority construction work probably can't be cut back very much. Industry will have to continue producing repair parts to keep the civilian economy going.

So the full impact of mobilization will hit the nonessential consumer goods—autos, appliances, and other civilian products made of metal.

It's too early to say with precision how much autos and appliances will be cut back. Until the armed services come up with a strategic plan that can be translated into tons of steel and pounds of copper, any calculations have to be approximate.

But it's likely that autos and appliances will have to be cut back 50% by midyear, perhaps almost completely by the end of the year.

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You can expect the U.S. to set up full controls over the key metals by, say, Labor Day.

Pressure on metalworking will be so great that only a controlled materials plan—similar to that used in World War II—will channel the metals where they are needed.

This year of 1951 will also see the world's trade in key raw materials brought under strict government controls.

President Truman and Prime Minister Attlee are setting up groups to work out commodity agreements. Result will be a combined raw materials board similar to the one that controlled international trade in World War II.

But the job is much more complex than it was in 1940-45—and so it will take months to work out the agreements and put them into effect.

•

In the last war, Britain and the U.S. were practically alone in the market—and they controlled all the shipping. They could almost dictate terms to the countries producing wool, rubber, tin, coffee—and dozens of other essential materials.

Now practically all countries in the non-Russian world must come into negotiations—either as buyers or sellers. And the sellers this time are driving a hard bargain. They want not only a good price for what they have to sell, but also guarantees that they will be able to buy what they need to import at reasonable prices.

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So don't look for much of a lowering in prices. Chances are the buying countries will have to agree to prices close to today's high level on most commodities. And prices may even go up more.

By year's end though, chances are that world trade will again be on a war basis—with prices fixed and supplies allocated among countries—and among users within the countries.

•

U.S. industry is on its way to new production records. Defense orders take more manpower for a chunk of metal than do civilian—so employment and output figures will climb sharply when defense production gets rolling.

Federal Reserve Board's Index of Production may level, or possibly drop a few points in the next few months—as industry shifts to defense orders. But sometime this summer it is likely to be 20% above its June, 1950, level. And mobilization will push it steadily higher.

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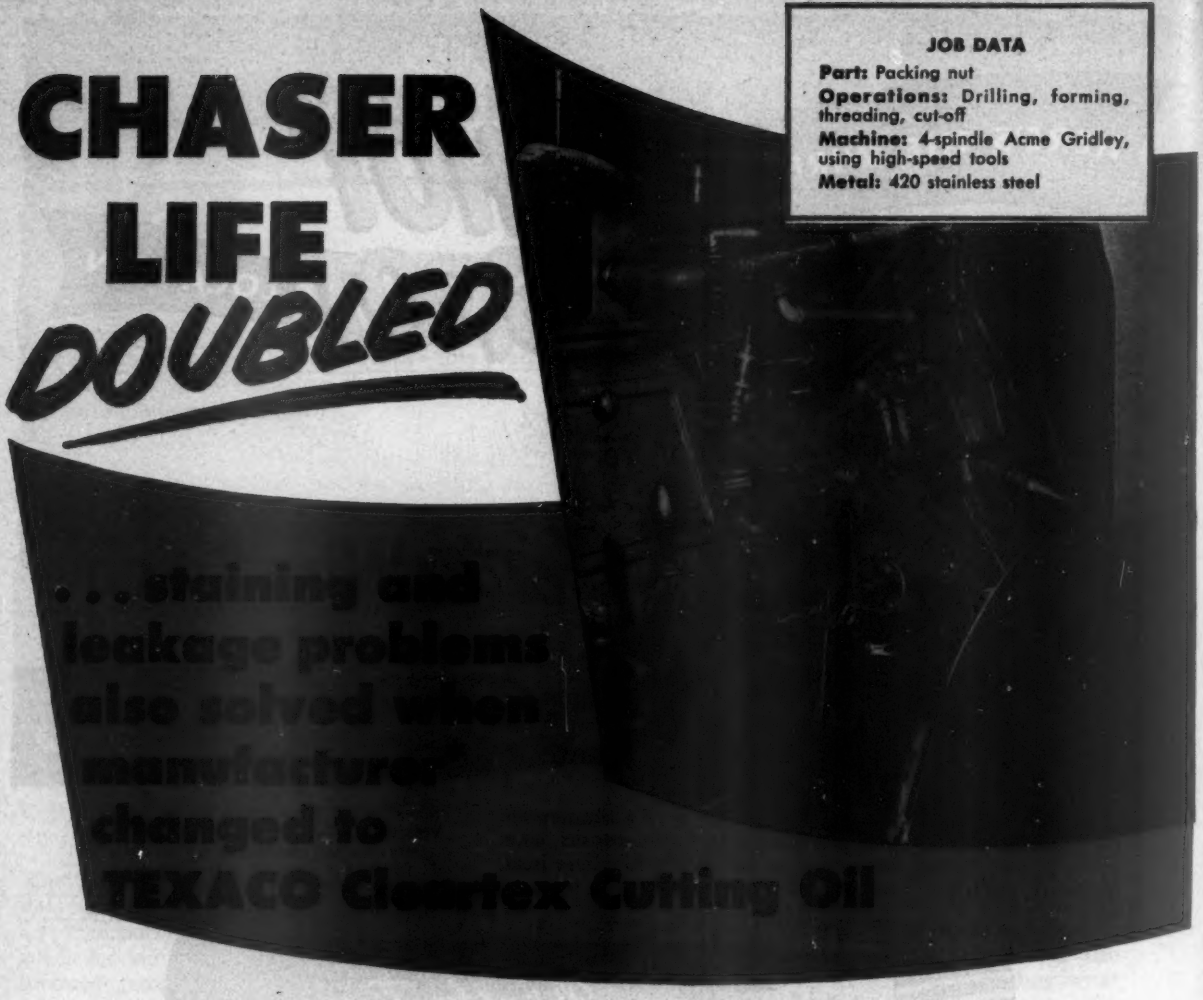
National Electric PRODUCTS CORPORATION

1347 CHAMBER OF COMMERCE BLDG., PITTSBURGH 19, PA.

CHASER LIFE DOUBLED

JOB DATA

Part: Packing nut
Operations: Drilling, forming, threading, cut-off
Machine: 4-spindle Acme Gridley, using high-speed tools
Metal: 420 stainless steel



The stainless steel used on this job is one of the toughest metals to machine. Operators reported their greatest difficulty was frequent breakage of the threading chasers, none of which lasted more than three shifts (24 hours). In addition, leakage of machine lubricant into the cutting fluid caused contamination and high oil consumption.

At the suggestion of a Texaco Lubrication Engineer, the competitive cutting fluid and machine lubricant were both replaced by *Texaco Cleartex Cutting Oil*. Chasers now last six shifts (48 hours) —*double the life!* Because *Texaco Cleartex Cutting Oil* is dual-purpose—designed to serve as both cutting fluid and machine lubricant – contamination has been completely overcome and oil consumption materially reduced.

Still another advantage gained from the change to *Texaco Cleartex Cutting Oil* is that either steel or brass can be worked without changing oils. *Texaco Cleartex Cutting Oil* does not stain.

Let a Texaco Lubrication Engineer—specializing in machining—help you gain similar cost-saving benefits in *your* plant. There is a complete line of Texaco Cutting, Grinding and Soluble Oils to assure better, faster, lower-cost machining, whatever the metal or the method of working it.

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FACTORY MANAGEMENT AND MAINTENANCE

"If They'd Only Ask the Maintenance Department!"

A maintenance boss in a big national company, with half a dozen plants, is talking:

"My management sure is missing a bet. They seem to forget that the men in our department know more about the plant equipment than anyone else in the place. When they buy new machinery do you suppose they call us in and get our slant? No, indeed. We don't know anything about it until they hand the stuff over to us to install.

"All we're supposed to do is keep the plant running by making fast repairs when something breaks down. Oh, yes, we do some preventive maintenance—of a sort. But our budget—if you can call it that—is so uncertain that we really can't plan preventive maintenance right.

"If business slacks off a little, or looks as if it's going to, then right away the maintenance department's allowance is cut and we have to start laying off. Actually, we'd be smart to take advantage of periods of slack time on the machinery to get it back in good condition. That would save money in the long run.

"I don't know whether the management people realize this or not. Maybe they do and are just too short-sighted to care. But if they'd only ask the maintenance department, we could save them plenty! And we could give them a lot of good advice on what kind of production equipment to buy—and when it's time to buy it. We really know what machines are costing too much to maintain."

Fact is, good managements do

Our friend talking above is not an extreme case. There are still many companies that take as backward an approach to maintenance as his management does.

For contrast, have a look at what some really progressive plant managements say: Their views on the maintenance function are highlighted in the first section of a 40-page special report on the management of maintenance. The report is published this month in FACTORY. It starts on page 81.

One of the most interesting points these managers make is the help that the maintenance department can give in advising on purchases of production equipment and other machinery.

Maintenance men know what machines can stand the gaff with the least trouble. They know when machines have used up their economical life —when it's costing too much to keep them in running order. The maintenance men know a lot about the faults and virtues of the design of machines they take care of. In fact, they can't help but be savvy about the plant and machinery.

Management's job is to tap this valuable source of information—to get the maintenance department on the varsity team of plant management, where it belongs.

One way to do this, of course, is to call on the maintenance-plant engineering group for full and frequent advice. But if this advice comes just off the top of the plant engineer's head (or out of his "little black book"), it's going to be sketchy at best. The real way to make use of the maintenance men's savvy is to get down on paper their experience with every piece of equipment in the plant.

That means equipment records. They show just what preventive maintenance and repair have been done on each item of plant and machinery. This way, plant engineering supervisors, or upper echelons of management, can make a real study of the valuable facts that maintenance develops.

But such records don't just grow. Someone has to keep them. That means clerical help in the maintenance department. Some plant managers scream that such help is just "indirect labor to service indirect labor"—and they won't have any part of it.

This is a pinchpenny attitude that costs real dollars. For proof, we offer our special report on "How to Get Your Maintenance Money's Worth."

Get Ready Now for a New

It will take months to get a new CMP into operation (timetable below). But it will also take you a long time to get set to operate under it.

Right now is the time to find out what CMP is, how it worked in the last war, what changes can be expected, what you will have to do to live with it.

BY CARROLL W. BOYCE • NATIONAL AFFAIRS EDITOR

AFTER WEEKS OF SPECULATION, the lid is finally off on plans for a new Controlled Materials Plan. It's definitely coming in 1951 — and probably on a faster time schedule than anyone thought possible a few weeks ago.

We had a CMP in the last war. It was based on the theory that if you controlled 100% of the production and distribution of a few basic war materials, other materials would largely take care of themselves. And it worked that way—up to a point.

In World War II, CMP was announced November 2, 1942. It did not become fully effective until July 1, 1943. Until a few weeks ago, everybody thought that manufacturers could be given at least as much and perhaps more time to prepare for the new plan.

That's out now. Even by starting today, you'll have trouble getting ready for CMP on the schedule outlined below. There's a good chance that it will be speeded up by a full quarter.

Here's the Probable Timetable

December 1, 1950. General Harrison's NPA, which will probably administer a new CMP, mailed out form NPAF-1 to 8000 metal fabricators. It asks for reports of inventories, 4th quarter 1950 consumption, and probable 2nd quarter 1951 consumption of the materials most likely to be included in CMP. It also asks for a breakdown of consumption by rated (DO) and non-rated orders. The 8000 reporting plants are estimated to represent 80% to 85% of the nation's consumption of materials covered.

January 31, 1951. All NPAF-1 forms must be completed and returned to the Bureau of the Census. (If you received NPAF-1 and need help filling it out, get in touch with M. R. Conklin, Bureau of the Census, Washington 25, D. C. By telephone, it's LUdlow 4300, Extension 248. If you did not receive a copy, it means you do not have to file. But it would be a good idea to get a copy for reference and study it. Write Edward K. Moss, Office of Public Information, NPA, Room 5111, Department of Commerce Bldg., Washington 25, D. C. With minor changes, the form of NPAF-1 is the same as the form used by the Annual Census of Manufacturers for metal fabricating plants. NPA hopes to simplify both its job and yours by sticking to a form that is familiar, and for which you probably have information readily available. It's worth noting that information on NPAF-1 is available only to defense agencies. It may not be examined by the Federal Trade Commission or other group that might like to see it for non-defense reasons.

Mid-March, 1951. Statistical analysis of NPAF-1 will be completed by the Bureau of the Census and forwarded to NPA. NPA will then decide whether NPAF-1 has produced enough information on which to base a CMP.

At this point the timetable becomes iffy. If NPAF-1 produces enough information and *if* military spending continues at its present rate, you will find:

Early second quarter. CMP will be announced in definite and detail form. All materials to be controlled will be specified, reporting forms made available, claimant agencies named.

Second quarter, 1951. Claimant agencies will release programs to manufacturers, and begin collecting bills of materials up the manufacturing ladder. (See chart, "How CMP Works," on page 70.)

C.M.P.

(CONTROLLED MATERIALS PLAN)

Third quarter, 1951. CMP will start in partial operation. That is, it will operate for those programs on which requirements and planning are complete. Other programs will operate "in parallel" under a priority setup. Note: If the need is pressing, an effort may be made to get the whole program into full operation at this time.

Fourth quarter, 1951. CMP fully operative. Controlled materials available only through CMP allotments. All priorities cancelled with respect to controlled materials.

What a New CMP Means

Most Washington planners see in CMP a complete answer to all control problems. A lot of businessmen visiting Washington—and in the field—agree, and are urging a new CMP as soon as possible.

When you talk with these people—both the controllers and the businessmen—you get the impression that a lot of memories are pretty short.

The fact that ham-on-rye is more palatable than hardtack doesn't mean it is a complete, balanced meal. CMP was our ham-on-rye in World War II.

The theory behind CMP—and the thing that makes it look so attractive today—was to insure a balance between supplies of basic materials and the requirements of authorized programs for those materials. CMP did this job pretty well with respect to the controlled materials—carbon and alloy steels; copper; brass alloys; and aluminum.

But, to round out our control diet, we needed a separate, parallel system to provide manufacturers with component parts and non-controlled materials.

What You Can Do Right Now

First thing to do is get NPAF-1. The items listed on the form are the ones most likely to be included in a new CMP.

► Then figure out what products you are most likely to continue producing. And what new items you will most likely be asked to produce under government contract.

► For each of these products, determine just how much of each of the NPAF-1 materials you will need *per piece* or per unit of production. Catalog this information.

► Determine what you will need per piece for each of these products in the way of non-controlled materials. Catalog it.

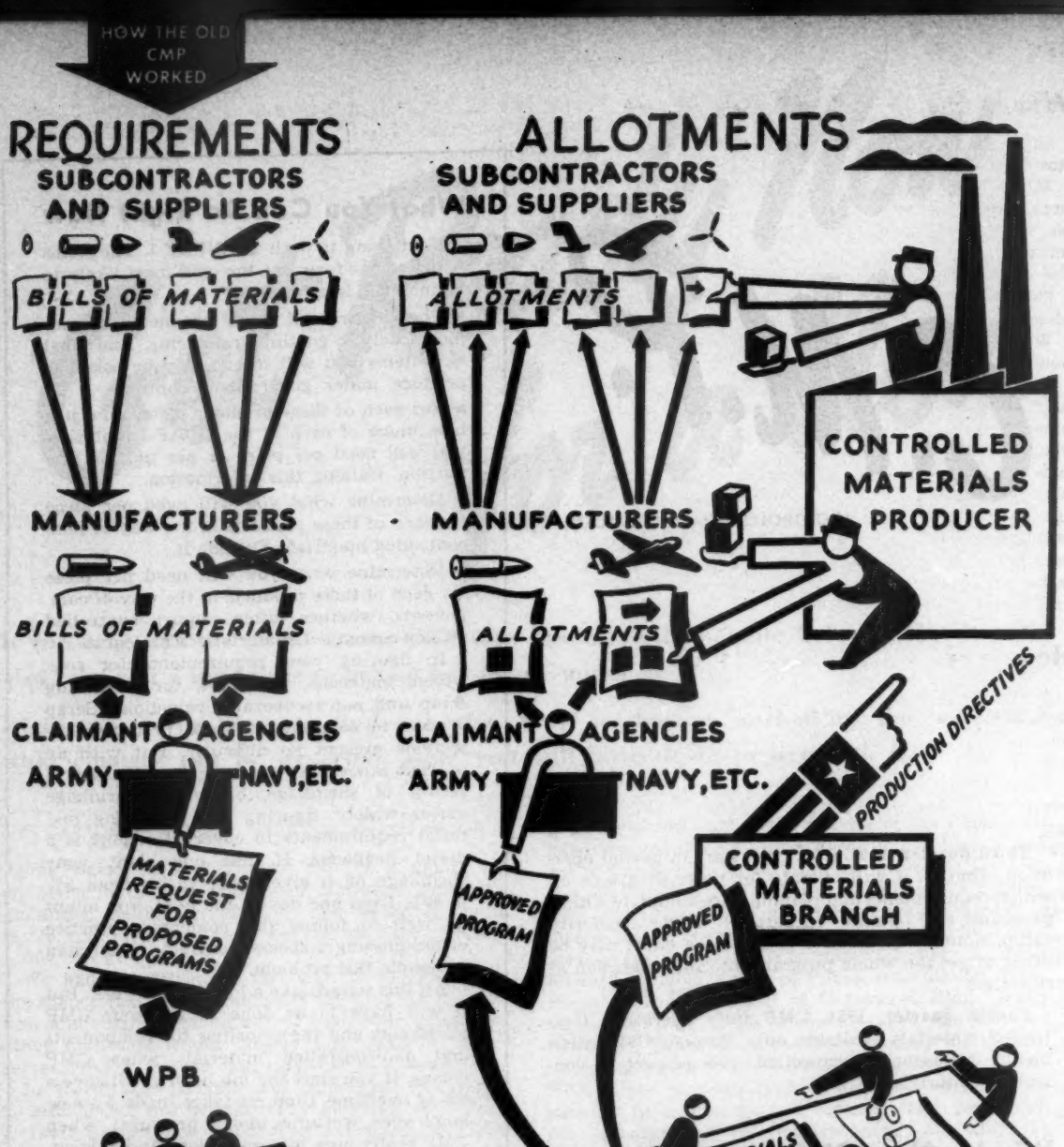
► Determine what you will need per piece for each of these products in the way of components, whether latter require controlled or non-controlled materials. Catalog it.

In figuring your requirements for controlled materials, you allow for machining scrap and non-recoverable rejections. Scrap is easy to compute. In some processes, rejections present no difficulty. But with an untried process where there is no historical record of shrinkage, or where shrinkage varies widely, figuring and justifying material requirements to cover rejections is a major headache. If, like one plant, your shrinkage on a given part varies from 5% to 90% from one day to the next, you might do well to follow this company's practice of designating a special contract liaison man to handle this problem.

All this sounds like a lot of paperwork. But it will have to be done to get your CMP allotments and the priorities for components and non-controlled materials when CMP comes. If you start the job now, you'll save a lot of overtime (and mistakes made by new employees working under pressure) when CMP really goes into operation. And particularly in the early stages, ability to demonstrate a sure knowledge of what you require will help plenty in getting needed priorities.

There's one more very important thing you can do: Find the men in your company who were intimately connected with the operation of CMP in World War II. Maybe they were with other companies at that time. Their experience will still be valuable. Either through a formal committee arrangement, or through informal discussions, milk them dry of their knowledge of CMP—how it affected them before, and how the same plan would affect your company today. The new CMP will be sufficiently like the old one to justify every minute of time invested in this review. And it will pay you handsomely to act and act quickly on the recommendations these men make on how to get ready for the new CMP.

More on next page



THIS SKETCH — reproduced from December, 1942, FACTORY — shows how the Controlled Materials Plan of World War II functioned.

The "mechanical" steps shown were preceded by program determination by Army, Navy, Office of Civilian Supply, etc. These agencies, known as claimants, figured out what was needed to support armed forces and civilians. Prime and subcontractors were notified of requirements.

Bills of material for controlled materials—steel, copper, brass, and aluminum — were then summarized through manufacturing chain to claimants and War Production Board. WPB "balanced" demand with available supply by "adjusting" programs, directed mills to produce alloys and shapes needed.

Manufacturers were assured of delivery in full of allotments for the calendar quarter.

Non-controlled materials and components made from non-controlled materials were covered by a separate system of "preferential" priorities.

GET READY FOR A NEW CMP . . . begins on page 68

Where the Old CMP Fell Short

In looking back at CMP, there are two points that stand out like sore thumbs:

While CMP guaranteed delivery of steel, copper, brass, and aluminum, these were the *only* materials on which it guaranteed delivery. For all other materials and components, it left the manufacturer at the mercy of a disorganized system of priorities.

No attempt was made to reconcile available supplies with commitments *before* contracts were let.

Will a new CMP have these same failings? Right now, there is no way to tell.

But even if CMP becomes open policy, you can expect details to be scarce until it is announced in complete form. Lack of discussion will insure an imperfect plan. But, as the War Production Board found last time, "full" discussion never ends and you get no plan at all. The pay-off will be in whether the agency administering CMP becomes inflexible or is willing to hear complaints and amend the plan and modify its organization as experience dictates. This latter attitude was one of the strong points of WPB and certainly the one feature that saved CMP.

How a New CMP Will Work

A few things are fairly certain. You can make "educated guesses" on enough more points to get a reasonably clear picture. Clear enough to give you a good idea of the steps you can take to get ready.

A new CMP will not control all materials. WPB never extended the World War II CMP beyond the original list—steel, copper, brass, aluminum—despite plenty of pressure to do so. But careful study indicated that most materials—even though far scarcer than those on the controlled list—are not suited to CMP. The volume of paper required for CMP is too great to justify including materials other than those that spread broadly through the manufacturing economy. And CMP works only where there is reasonable assurance of a steady supply that can be determined in advance. So cobalt, for example, one of the scarcest materials at present — would not be brought under CMP. Its uses are too limited, and the supply is too erratic, dependent almost entirely on imports of greatly varying quality.

NPA's first inventory reporting form (NPAF-1) provides the tip-off on materials to be included in a new CMP: Iron and steel foundry products; steel mill shapes and forms; aluminum; copper and copper base alloys; and magnesium. Magnesium is a new item. The key is this: The fact that a material is included on NPAF-1 doesn't guarantee it will come under CMP. But without at least as much statistical information as will be obtained from NPAF-1, it will be impossible to apply CMP.

Inventory reports now coming in will also provide plenty of information about tin and rubber. Tin is only a remote possibility and it would be surprising to find it on a CMP list. But there's a good chance rubber may turn up. WPB wanted to bring it under control in World War II, but certain peculiar characteristics of the rubber situation made this impossible. The situation has changed — because of the many synthetic plants—so rubber is being reviewed carefully to see if it can be brought into CMP.

Actual operation of CMP—for the most part that means paperwork—will be changed little from World War II. You will still have to produce summary bills of materials for each controlled material, by contracts and program authorizations, and send them up the ladder.

There is scant chance that the paperwork load will be cut by review and reduction of potential contracts and programs to attainable limits *before* letters of intent are issued.

The new Office of Defense Mobilization (ODM) is in a position to insist that the Munitions Board and other defense agencies work closely with NPA in planning programs. There is every indication it will.

But even so, we may repeat World War II experience: Letters of intent will be issued covering programs that require far more than the available supply of controlled materials. You will have to prepare bills of material based on all those letters. When the cutbacks are made, you'll find that maybe half of your paperwork was for production that was clearly impossible in the first place.

Obtaining non-controlled materials and components will probably be neither more nor less of a headache than last time. There is a possibility, however, that programs will be reviewed before being released with a view to determining whether non-controlled materials are available. This was not done to any degree by WPB, with the result supplies of controlled materials were often tied up by companies which were stalled by component and non-controlled materials shortages. It would be a big help if this were done. Charles E. Wilson's ODM has wide enough authority. It's too early to tell how Wilson would fare in the resulting argument with the military.

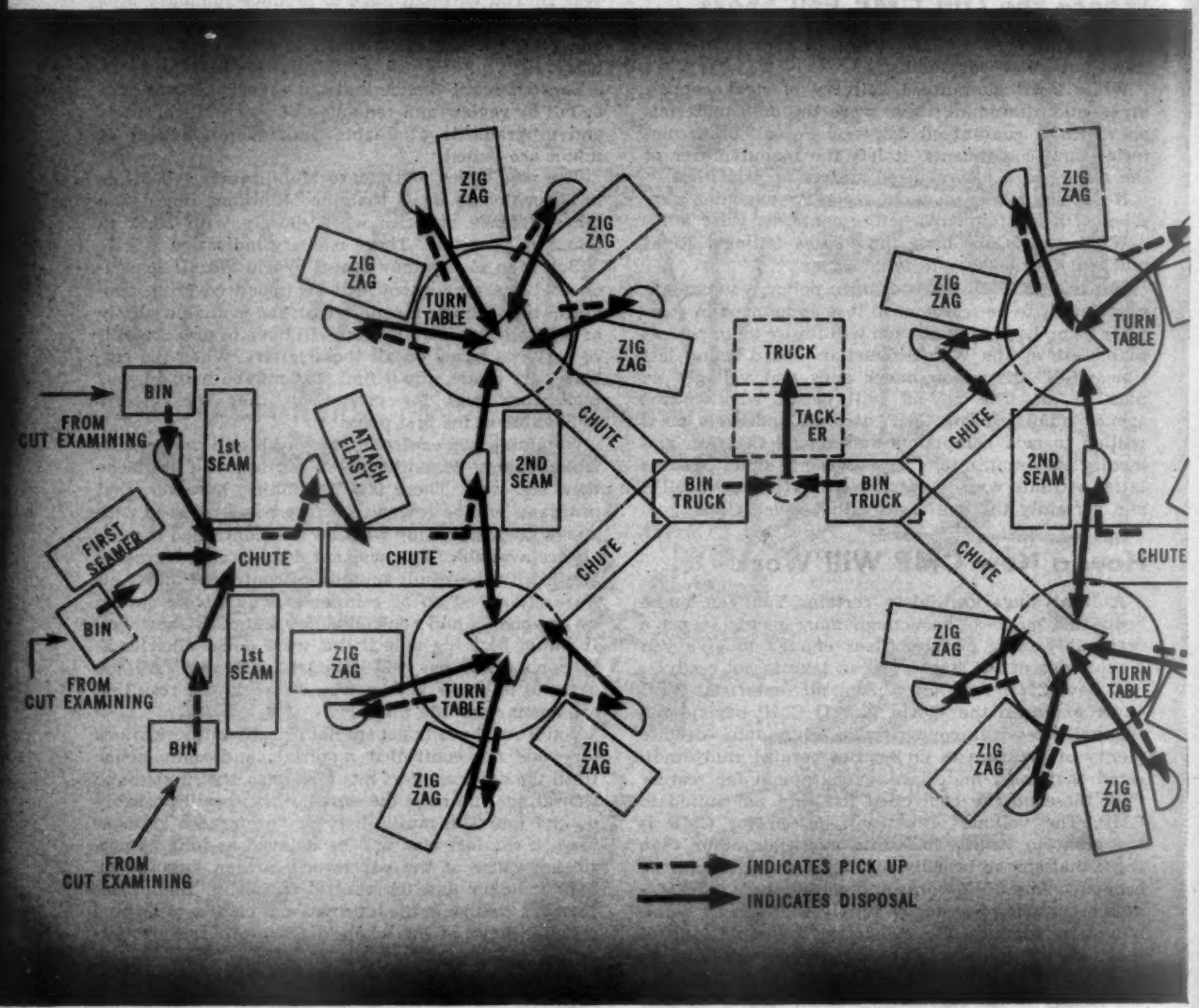
You'll still have to get special priority authorizations for your non-controlled materials and components. Until the defense effort hits high gear, the single-band DO ratings (all have the same priority) will probably do the job. The multiplicity of "preference ratings" used in the last war will be delayed as long as possible because of the paperwork burden imposed on both industry and the control authority. But unless there's a change in the international picture to bring a slowing down of the whole defense program, preference ratings are a certainty in 1951.

A side issue of CMP will be the manner of handling requirements for maintenance, repair, and operating supplies. In the last war, WPB issued a special MRO order, granting an automatic A-10 (lowest possible) priority to such requirements. The contracting officer was authorized to increase the priority rating up to AA for the purpose of repairing or replacing production machinery where breakdowns threatened to tie up an entire contract.

Little if any thought has been given to how MRO will be handled this time. As one NPA official explains: "We are operating on a policy of selective neglect. Right now we are neglecting MRO because so many other things are so much more important." No matter what the final solution, you can be sure that MRO will require plenty of personal expediting.

TO SUM UP: We are moving rapidly toward a new CMP. On the way, we are making the same mistakes we made last time. Initially you can expect the new CMP to be some improvement over the old one.

The whole pattern is so similar that one NPA official commented: "There is just as much confusion as there was in the early days of World War II, only this time it's better organized."



CHUTES AND TURNTABLES, shown above, are key to motion economy in this new garment-making layout. Work flows from the cutting room to both ends of the line. Then it flows toward the center where it is put on

New Layout Means Less Walking, Less Handling, More Output

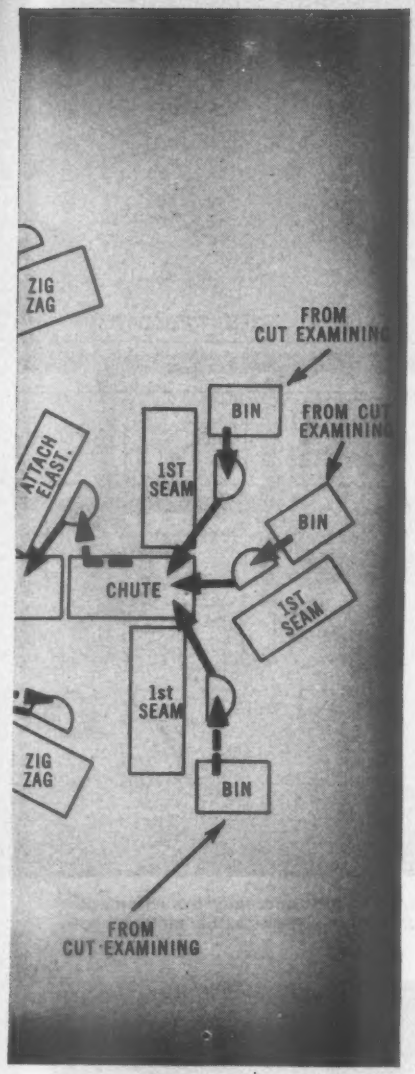
- **Greater flexibility in the garment-making process . . .**
- **Easily balanced line operations . . .**
- **Much more work per direct-labor hour . . .**

These are the rewards to Julius Kayser for applying sound engineering principles.

By EDWARD ZAKAR
Methods and Standards Department,
Julius Kayser & Company, Allentown, Pa.

WE'VE SAVED THOUSANDS OF DOLLARS' worth of labor in the last 2½ years through use of turntables, special fixtures, conveyors, and a better work flow arrangement. Product quality is better, too.

Before, all of our sewing operations were done on long driveshaft tables. These needed continuous servicing by floor personnel. Bundles had to be picked up, carried, and delivered by hand to all sew-



trucks and moved to next operation (see following pages).

TURNTABLES AND CHUTES at worktable height permit easy pickup of bundled garments. Handles on the turntable make rotation easy.

ing and finishing operations. Operators, inspectors, and pressers had to stoop down to pick up their work. When inspecting garments, the inspector's hands were his only fixtures. This slowed work and raised inspection costs.

Repair tickets had to be filled out by hand for each piece of fabric in which a flaw was found. Household-type hand irons were used for all pressing operations.

Now, things are different. They're different because we put a lot of thinking and planning into the new production setup before reaching a final decision.

We settled for bundle progression because:

1. Line production doesn't give us the flexibility we need to make our garments. We change frequently from style to style and garment to garment, and production flexibility is a necessity.

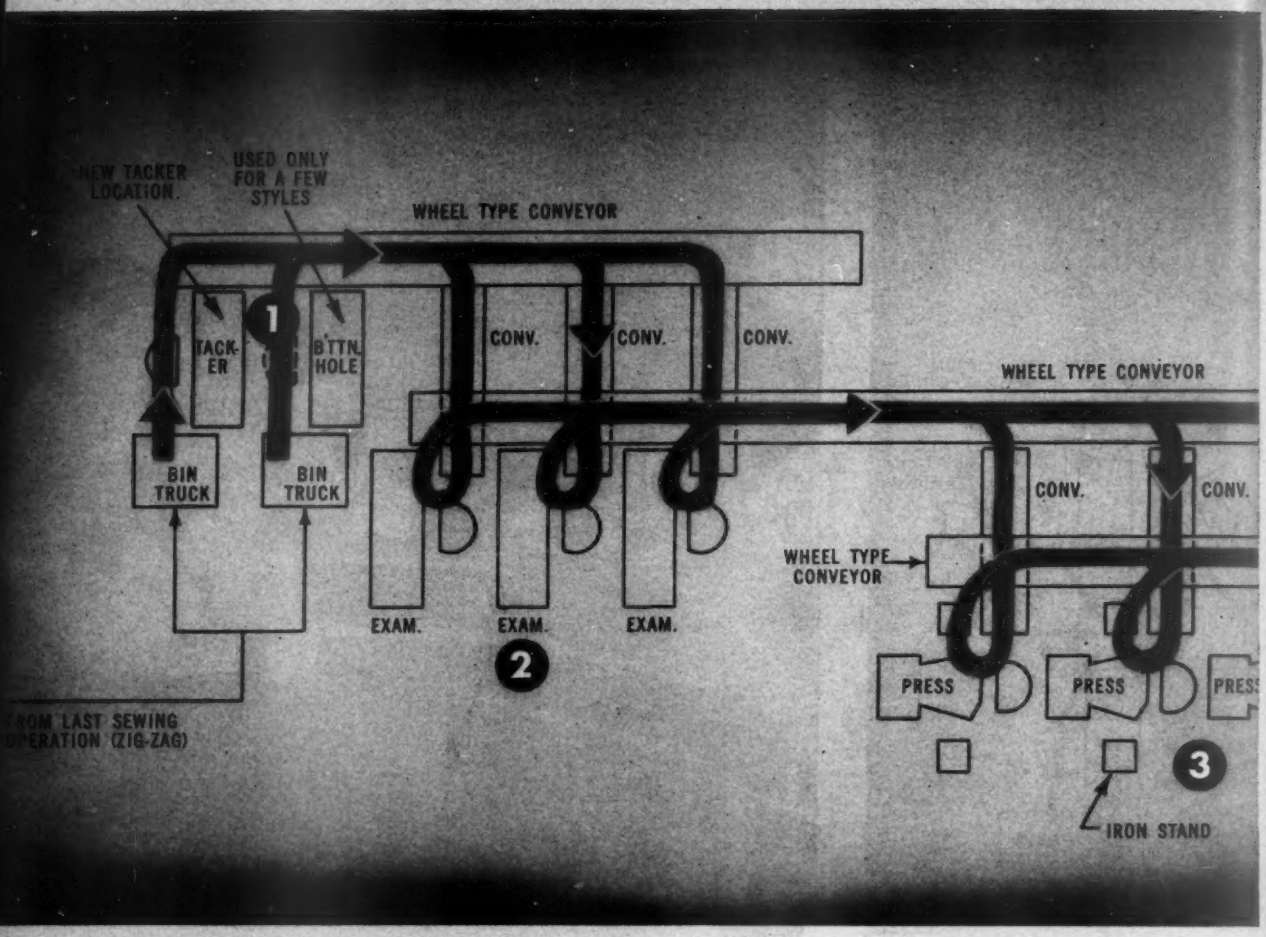
2. Many of the operators had to be classified as semi-skilled as they were switched, say, from glove to underwear operations.

It would have been a tough job to set up a line unit with any safe degree of balance when we had no individual production records for underwear production. Just because a girl rated 100% efficient in glove fourchetting didn't mean she'd have the same efficiency when she moved to underwear seaming.

One of the big problems that had to be overcome was how two seamers could feed work to fourteen zig-zaggers, who, in turn, had to feed one bar tacker, without the purchase of power-driven conveyors at the cost of $50 per foot.

But, by incorporating the use of four inexpensively constructed turntables and four inclined open-end chutes, we beat this problem.

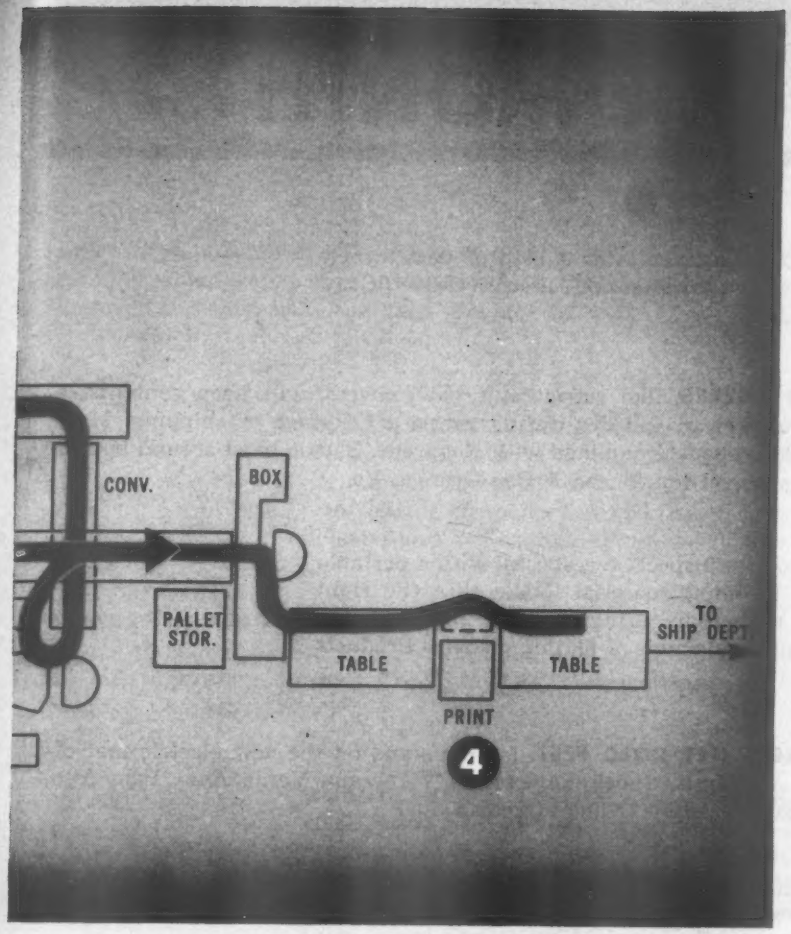
Turn the page to learn how four new methods speed the work ——→



CONVEYORS speed the work through the examining and finishing operations in the new layout. Work flows from left to right until it is packed and ready for shipment. Numerals in the diagram are keyed to the pictures be-

1 TACKING. Side-hinged bins bring bundles to work station. Table has been elevated so work can be placed easily on conveyor when completed. Worker positions panties on pallet so they are in position for pickup at next station.

2 INSPECTING. This special indexing fixture speeds inspection. A 180-degree turn gives a fast, well-lighted look at both sides. Garments are counted automatically. Aluminum spring-clip clothespin marks defect, lower right.



low. They show how improved methods help Julius Kayser to get full benefit from its streamlined layout.

3 PRESSING. The old-fashioned ironing board is out. In its place are flip-flop boards — interchangeable according to size of garment. Pivot speeds pressing operation 102%.

4 PRINTING. Stand and press were fabricated in the shop. Only type change is for size. Adjustable brackets permit easy changeover to various-sized boxes.

Begins on page 72

Here's How the New System Works

Here's How Our New System Works. Sufficient cut work for a full 8-hour shift is brought from the cutting department to the first seamer station. After the first seaming operation is completed, the seamer throws the bundle into a chute that delivers the work to the girl who attaches the elastic. She, in turn, throws the completed work into another chute. It delivers the bundles to the second seamer.

The second seamer can throw the bundles into either of two chutes, right or left, depending upon which turntable for zig-zaggers needs work. The zig-zaggers throw their work into open chutes that feed into two false-bottom bin trucks.

These trucks are wheeled to the tacking station on a platform 10 inches above floor level. Completed work is placed on pallets, and the pallets are placed on a gravity conveyor. They are shunted off onto small storage conveyors at the inspecting stations.

How We All Benefit. Everybody has benefited—the company, the worker, and the customer.

- Direct labor losses have been reduced about 30%.
- Hand-carrying of raw and semi-finished goods has been reduced to a minimum.
- Trolley duct for lighting and power distribution, and the individual drive sewing machines allow greater production flexibility. Machines and equipment can be regrouped as desired to make the garment currently in production.
- All work gets to the workplace at seat height, eliminating previous stooping.
- Standard time for inspection has been cut 22%. Indexing fixtures speed the work. Aluminum clothespins mark defects. The tickets have been thrown out.
- Production is up 102% and 3400 man-hours were saved with the flip-flop boards. Over 100 hand motions have been saved.
- We designed a special hand-printing machine. This saved the initial cost of semi-automatic power-driven equipment, which would have been idled more than 50% of the time.

IDEAS OF THE MONTH *for*

SMOOTHER SPRAYER. If your spray guns splatter a blob of paint when you start to spray, you'll want to look into a device called Evenflow. Gray Co., Inc., Graco Sq., Minneapolis 13.

SLIPOVER COVERS, like refrigerator bowl covers, will keep contents of 55-gal. drums clean and dry during temporary storage or shipping. Made of heavy kraft paper combined with Neoprene. Elastic band around bottom edge grips barrel top. Snead & Co., Orange, Va.

SAVE STEEL. Avoid needless scrap. Cut inspection costs. All with a portable thickness gage. Use it to check incoming material. Make sure the right sheets are issued from stockroom to manufacturing. Use it to measure stock before and after plating to determine thickness of plating. Federal Products Corp., 1144 Eddy St., Providence 1.

IF WORKERS GET COLD FEET, let 'em stand on the new electric mat offered by Walter B. Snook Enterprises, 751 Loma Verde Ave., Palo Alto, Calif. Measures 16 by 27 inches, costs $21.50.

OVER-REACH is a 6-ft. ladder that can be raised to any height up to 26 feet. There's a small platform—with guard rail. Unit is on casters. $300. Atlas Industrial Corp., 849 39th St., Brooklyn 32.

DOUBT IF YOU NEED one of those big electronic calculators. But Remington Rand, Inc., 4th Ave. and 23rd St., New York 10, will soon have a small one on the market. Says it can be used economically by companies with as few as 100 employees. It's reported to be 100 times faster than the fastest mechanical calculators.

ATHLETE'S FOOT hasn't a chance with "Miracle Mat," says Foam-X Co., 332 W. Alamar Ave., Santa Barbara, Calif. Plastic reservoir holds gallon of fungicide—which is automatically fed into sponge rubber mat as solution is used up. Try it for two weeks—at maker's risk.

STOP THAT FLOOD from an overhead sprinkler. Sprinkler Stopper Co., 170 S. Van Brunt St., Englewood, N. J., will sell you a wedge for $9.75 that does the trick. Just insert the stopper in the sprinkler ring. The idea is to save water damage when the flames have gone out under one head, but fire still needs watering from rest of system.

TEST MOISTURE CONTENT of foundry sand in 2 to 5 minutes with a unit made by Claud S. Gordon Co., 3000 S. Wallace St., Chicago 16. You balance a sample of sand in a tray, dry it with a heat bulb, then balance again. Dial shows per cent of moisture you've removed.

Factory Executives

KEPS are pre-assembled nuts and lock washers. They're designed to make assembly operations easier. And to assure tighter, stronger connections wherever threaded nuts are used. Shakeproof, Inc., Div. of Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39.

BOILER WATER can now be treated for about half the former cost. That's the claim made for Luminite, a new coagulant developed by The Warren Refining & Chemical Co., 750 Prospect Ave., Cleveland. Combines advantages of chemical and colloidal methods. And—because no two boiler installations are exactly alike—it's custom made.

PRESSURE SEALING ZIPPER is a unique arrangement of overlapping rubber lips on slide fasteners. Provides complete seal against gases and liquids ranging from zero pressure to structural strength of fastener used. The B. F. Goodrich Co., Akron.

COUNT-O-PAK is a new machine that automatically counts and packages small parts like washers, nuts, pins, etc. Fill the hopper and an electric counter does the rest. Counter is adjustable from 1 to 999 pieces by simply setting dial. When carton has been filled to proper count, it is automatically ejected to a conveyor; then operator closes carton, inserts an empty one. Inter-Lakes Engineering Co., 4845 Bellevue, Detroit 7.

SELF-POWERED WHEELBARROW will pull a full load up a 40% grade. Compression acts as brake on downgrade. Speed on level is a comfortable walking pace. S. & S. Vending Machine Co., San Jose, Calif.

BAG FLATTENER, for plants that pack and ship in bags, is designed for use as a pallet loader. It applies a kneading and pressing action to the bag which eliminates air and distributes contents evenly. This provides a flat bag that piles better—and saves space. Flexoveyor Mfg. Co., 1220 S. Acoma St., Denver 10.

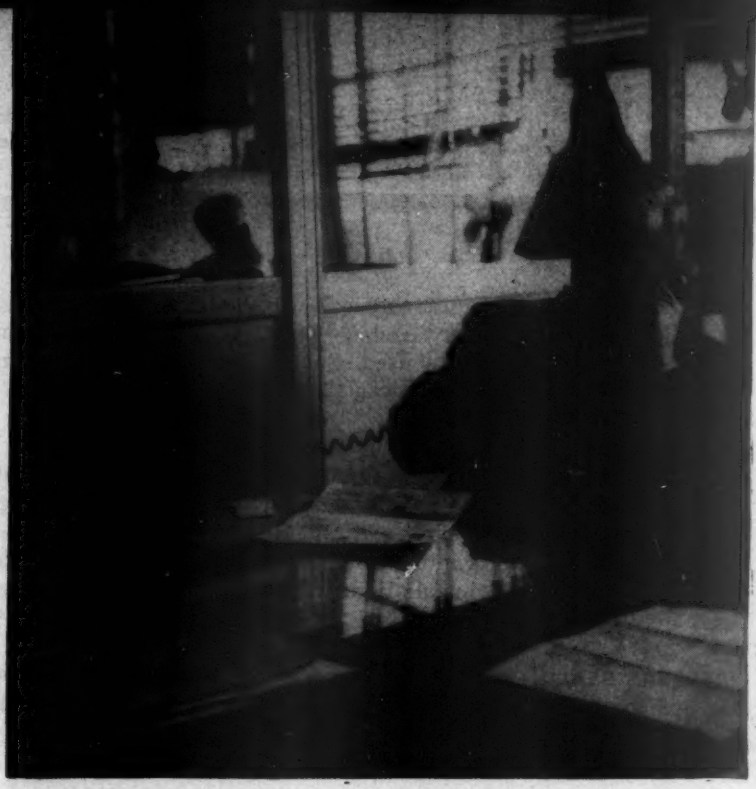
STORAGE WITHOUT BINS is what you get with wirebound pallet boxes. Part of front is cut out for easy access. General Box Co., 500 N. Dearborn St., Chicago 10.

IF YOUR VOLUME does not justify fully automatic packaging machines, better look into a new semi-automatic unit that can be changed over in 30 minutes to take a different size. Adjustable for an infinite number of sizes—all the way from ½x¾x2½ inches to 3¼x3¼x8 inches. Machine speeds can also be quickly changed through a range of 25 to 120 cartons per minute. R. A. Jones & Co., Cincinnati.

MORE IDEAS ON PAGE 258

▶ **Plant operating men at Tuttle & Bailey use their new in-plant telephone network to get information to — and from — the right people fast.**

▶ **And, instead of calling a meeting to lick a production or maintenance problem, an executive has only to pick up his inside phone and hold his conference then and there. Here's how a telephone conference works.** ——▶



EXECUTIVE INITIATES a telephone conference. When he wants to talk to several of his associates, there's no need for a time-consuming meeting in his office. He picks up the inside phone, calls one of the men he wants, asks him to dial a third man. He hangs on while . . .

We Pick Up a Phone — To Get Real Control of Operations

RIGHT FROM HIS DESK, Tuttle & Bailey executive can reach anybody in the plant no matter where he is. And the parking lot is covered too. A switch of the pager button and he can call anyone to the nearest phone.

By G. E. HERRE
Production Manager, Tuttle & Bailey, Inc.
New Britain, Conn.

IN A COMBINATION job-shop and straight-line production operation like ours, new orders are constantly being added. Old ones are being revised or shifted. Information must get to the right person fast.

Add to that the fact that the 450 people in our plant are scattered over a wide area. Such a situation makes good communications essential.

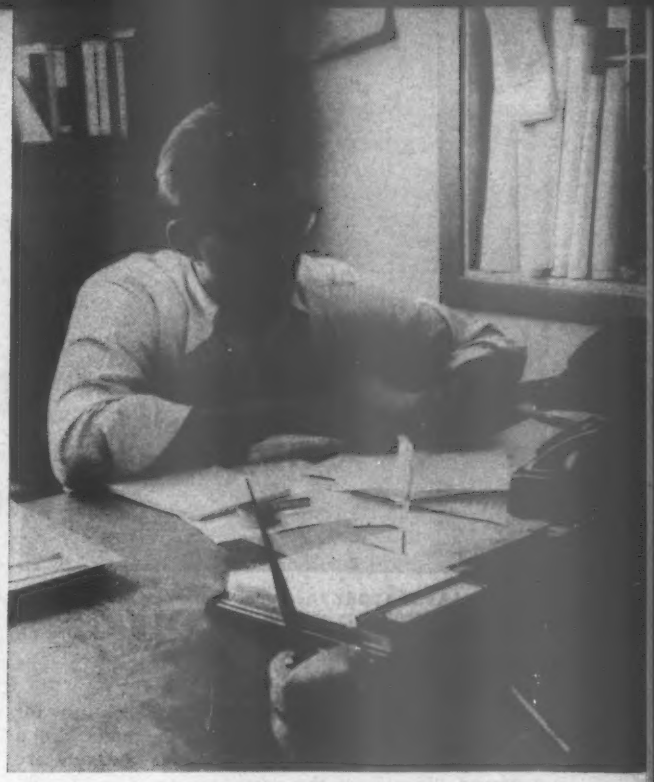
About a year and a half ago, we installed a system that more than fills the bill. The most important part of our setup is an automatic in-plant dial telephone network. Its 43 stations and 20 party lines enable anyone to talk to anyone else almost instantly.

Combined with this network is our general call system. With loudspeakers strategically placed—inside and outside the plant—we can reach any employee we want to speak to, no matter where he is.

We also have four standard "intercom" installations for special communications problems.

The in-plant telephone and general call system

SECOND MAN DIALS the third. The conference feature of Tuttle & Bailey's inside phone system leaves him connected to original caller's line while he dials a third man. At the other end of the plant, the . . .



THIRD MAN ANSWERS his conference call. When he picks up the receiver all three are connected on the same line. If more conferees are wanted, the procedure can be continued in the same manner.

cost us $16,800. Although actual dollar benefits are hard to figure, we're convinced that it will pay for itself fully in two years.

Besides, upkeep of the system is relatively inexpensive. A few tube replacements and minor adjustments made by our own electrical maintenance men are all that have been necessary, to date.

Versatility is a major advantage of our system. Here's what it will do:

In the Production Office • Suppose a customer calls me, and during the conversation asks a question only Joe Doakes can answer. I don't have to waste time transferring the call to Joe's line and then have the customer call me back. There's an inside phone right beside my outside phone. I dial Joe's department, and without waiting for an answer, I call his name into the telephone.

My dialing rings all the inside phones that are bridged together in Joe's department. The ring—a single stroke of the bell—is loud enough for people to hear, but not so loud that it will disturb. Everyone knows the call is for Joe, because when I called his name into my telephone, it was broadcast over a small speaker in his department.

So Joe picks up his receiver. This connects our phones and cuts out the loudspeaker. Our conversation is strictly private. Joe answers the question and I repeat the answer to the customer. There's no delay, no confusion.

Outside the Plant • Sometimes we find it necessary to call someone outside the buildings but still in the company area. There are three speakers covering the shipping dock, yard area, and parking lot.

On the Factory Floor • But what if Joe's out in the factory area? Then I put in a general call directly through my inside phone.

I simply dial a number that connects me with the call system. Then I say, "Joe Doakes, call 9." Wherever Joe is, he hears the call, goes to the nearest phone, calls me.

Speakers throughout the plant are set at the proper volume so that people can hear above the noise.

In the Maintenance Department • Our communications system helps us use our maintenance crew to the best advantage. For example, if a machine breaks down, the supervisor rings the maintenance foreman on his inside phone. If the repair man he needs is not there, a general call goes out for him over the loudspeakers to "call 600," which might be the number of the supervisor whose machine is down. Because of the call the repair man arrives at the job with the parts needed. A second trip is saved.

In the Laboratory • A complete intercom system speeds tests and demonstrations in our research lab.

The lab consists of a glass-enclosed office and a

More on next page

IN THE LABORATORY the supervisor uses the intercom system to control tests without leaving his office. Turn of the switch can get him an up-to-the-minute report on any project anywhere in the laboratory.

IN THE RECEPTION ROOM the central switchboard operator announces a visitor over the general call system. She also controls lunch-hour broadcasts, as well as speaker volume throughout the plant.

large work area containing several mock-ups for testing air-conditioning devices. In the office are a microphone and master speaker. Other speakers are scattered throughout the area.

With this setup, the laboratory supervisor has perfect control over his men at all times. A turn of the switch and he can get an up-to-the-minute report on any project. He can get or give the answer to a question without leaving his office.

In the Warehouse · There's another intercom system in our warehouse. Its two main purposes are to save time and steps. If the supervisor wants some stored items picked up and delivered to the checking area, he doesn't have to yell to someone at the other end of the floor. He just reads the order over the intercom and the order is filled.

In the Conference Room · The automatic inside telephone installation in this room affords a good example of what we gain by having an individual loudspeaker connected with each receiver or group of receivers.

Suppose a group of executives are in conference. The phone rings. A name is called out on the speaker. The *right* man answers the call.

Telephone Conferences · When a company executive wants to talk over some problem with several of his associates, he doesn't have to take up a lot of their time by calling them to a meeting in his office. If it's a matter that can be settled quickly, he can hold the conference by telephone.

He calls one of the men he wants. He hangs on while that man calls the third party. The third one can call a fourth. And so on until all the people wanted are on the same line.

Executive Right-of-Way · Two of our inside phones —the president's and the vice president's in charge of sales—have executive right-of-way. When either of them dials someone and that line is busy, a quiet buzzing signal sounds on the busy line. This notifies the parties that "the boss" wants to talk to one of them. They end their talk and await his call.

Special Features · The switchboard operator who takes care of our central switchboard also has control of the general call system. She has a microphone on her desk connected to all plant loudspeakers.

All supervisors are authorized to use the general call directly through their inside phones. Operator can page from her microphone when she wants to locate someone for an outside call or a visitor.

During the lunch period we broadcast music over the general call speakers. The switchboard girl connects a radio to the system.

General calls can still be made on it during this period. When someone sends out a call, the music automatically drops in volume.

Sometimes we broadcast important news or sports events over the system during working hours. We feel it doesn't interfere with work. The employees would spend time anyway trying to get the news or scores.

Power Unit · The heart of our inside phone system is a 4x8-ft. cage in one corner of the warehouse. The cage contains a control board with the automatic dialing equipment for our 43 stations, batteries, amplifiers, and other electrical apparatus. Like the amplifiers on the general call system control board, these amplifiers can be used to adjust the volume of each group installation.

The power to operate the in-plant system comes from batteries charged by our power lines. At first we had trouble getting a steady input voltage (even with the batteries), because welding machines and other electrical equipment made the voltage fluctuate widely. But we put a simple voltage regulator in the battery circuit and have had no trouble since.

Another major advantage of our inside network is that it carries 100% trunkage. This means every telephone in the network can be used at the same time without jamming, cross-connections, or other mechanical failures.

America's Road to Victory

. . . Let's Increase Production

This is the time to speak out—now—at the beginning.

Our industrial program for re-armament is getting off on the wrong foot.

The talking and writing about it emphasize the wrong things.

Its headline words are "cuts" and "controls."

Those words make bad propaganda for the cold war.

"Cuts" and "controls" are no words to challenge the imagination and energy of our own people. They won't impress the masters of the Kremlin. And they can only make it appear to the rest of the world that America thinks it can defend the free way of life by abandoning it.

America stands as the world's champion against aggression because America has become the most powerful free nation in the world.

How did we get that way?

Not by putting ceilings on wages; not by rationing or clamping iron-clad government controls all over business and industry.

To be sure, some temporary controls are necessary to channel very scarce materials speedily to use for defense. So, too, are special taxes and credit restrictions needed to combat inflation. But they will be fatal if they blind us to this fact:

We became the strongest nation in the world by out-producing every other nation.

Production—The Final Answer

Next year our government is planning at least a $40 billion military program. Instead of planning only on controls to divert $40 billion of production from the making of civilian goods to the making of military supplies, we should be figuring out also ways to push up total production.

Of course, our industrial plant is running at close to "capacity" now. And our labor force has reached almost full employment. There isn't much slack to be taken up.

Can even the United States add a $40 billion miracle of production on top of what it is already doing?

Our answer is "Yes"—and within two years. It can be done by adding about $6 billion each year to our program of capital investment which now runs about $22 billion a year.

Part of this added production will come from expanding our industries. The steel companies, for example, already have plans to increase their capacity almost ten per cent in the next two years.

But by far the largest part of that $40 billion of added production must come from higher productivity—raising industry's efficiency.

continued on next page

To meet our goals we need to raise our productivity five per cent a year.

Can it be done?

The answer is an emphatic "Yes."

Raise Industry's Productivity

McGraw-Hill's studies of industry's equipment show that there are countless opportunities for improving efficiency. Our manufacturing industries alone need at least $35 billion of new equipment to raise their facilities to first class technical standards.

Here are some of the broad possibilities reported by the trained editors of McGraw-Hill's business magazines:

In many manufacturing plants as much as 40 per cent of workers' time goes into moving materials and parts—shifting things about within the plant between processes and to and from shipping platforms.

FACTORY estimates that improved materials handling equipment and methods might well cut handling costs twenty-five per cent and save annually over 650,000 man-years of unnecessary labor.

Modern machine tools designed since World War II are 40 per cent more productive, on the average, than is old equipment. But AMERICAN MACHINIST surveys show that 95 per cent of industry's machine tools are of designs at least ten years old. Replacing them could raise productivity of the metalworking industries at least ten per cent—enough to absorb a major share of the metalworking industries' part of the defense program as now planned.

In coal mining, latest equipment and methods can raise productivity sharply. The editors of COAL AGE estimate that production of bituminous coal could be raised from seven tons per man-shift to ten within three to five years.

Many new textile production techniques are 50 per cent to 75 per cent more efficient than those in use now. If plants could be fully modernized, and full use made of latest management methods, TEXTILE WORLD estimates that output-per-manhour would rise 20 per cent. *A FOOD INDUSTRIES study indicates that modern equipment plus the best management techniques could raise productivity in food processing at least 20 per cent.*

These are just some of the opportunities that industry can seize and by which the nation can profit.

A Nation-Wide Effort

Of course, industry itself can't do the whole job. Labor, government and all the rest of us must cooperate.

Government's part is to see that its emergency controls are so applied that they will increase productivity and thus make possible an early lifting of such controls.

Labor's part is to help in the development of labor-saving methods and machinery and to welcome their adoption as the only sure way of continuing to advance the American standard of living while maintaining the American free way of life.

For all of us the job is to work constantly for an expanding, ever-stronger America with constantly growing productivity; not a pinched and shackled America cooped up under wage and price ceilings and tied to a ration card.

Challenge to Industry

Here is a sharp challenge to industry to study the best work-methods that are being reported—to use every minute and every dollar it can to replace obsolete equipment.

Here is a sharp challenge to government to do everything within its power to make its control policies and its fiscal policies strengthen the incentives to industrial modernization—to demand sacrifice for a purpose and not for effect.

The job to which such opportunities point will take time—though nothing holds back adoption of some of the simpler improvements in work-methods reported in business magazines all the time.

But increasing production is our one best hope that we may be spared the full array of price, wage and production controls now and be freed eventually from all controls.

General Omar Bradley has said that the protection of our national independence calls for "long-range commitments that we are willing to carry out."

A long-range commitment to fight this battle for peace with America's most powerful weapon—industrial productivity—is the surest guarantee of victory for the free world.

Let's make that commitment—now—at the beginning.

McGraw-Hill Publishing Co., Inc.

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HOW TO GET YOUR MAINTENANCE MONEY'S WORTH

GETTING YOUR MAINTENANCE MONEY'S WORTH is a good idea *at any time.* It's an even better idea *in a time of national emergency.*

We say that for two reasons: Industry is going to have to produce more goods than ever before in our history. It will have to produce those goods with the least possible waste of manpower, materials, and equipment.

That calls for good maintenance. The best maintenance you can buy. *Your maintenance money's worth.*

How much maintenance does that mean? That depends—in your case—on your answers to two questions:

1. What's the best maintenance program for my plant?

It takes two men to supply the answer—the plant manager and the plant engineer. When the plant engineer knows what management expects—and when the plant manager knows what the plant engineer thinks is best—then the two can work together on a suitable program.

To help *you* get the right answer for *your* plant, FACTORY's editors went to both the plant managers and the plant engineers:

First we asked fourteen executives: "What do you expect for your maintenance dollar?" *Their answers are given on the next eight pages, 82 to 89.*

Then we asked ten plant engineers in small, medium-sized, and large plants—and in nine different industries: "What kind of maintenance program would you set up if you could write your own ticket?" *See their answers on pages 90 to 103.*

There's real gold for easy digging in both sets of answers. Here's your chance—whether you're a plant manager or a plant engineer—to get the best thinking of other plant managers and engineers. Here's the best chance you've ever had to get both sides of the question.

2. How do I know I'm getting my money's worth?

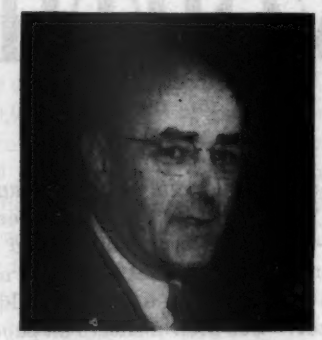
The best answer lies in complete control of every dollar you expect to spend. First you decide how much you need to spend. Then you make sure it's spent that way. If it isn't, you always know *why.*

There are different ways to control maintenance costs. To show you how well it can be done, FACTORY has assembled case studies from six plants on pages 104 to 119. They are all good ways, designed for specific production conditions. They are all practical, not experimental. They are full of ideas that your plant can adapt to make sure that its maintenance money buys the *best* in maintenance when nothing but the best will do.

HOW TO GET YOUR MAINTENANCE MONEY'S WORTH . . . begins on page 81

W. J. ALLABACK, The Thew Shovel Company, expects:

. . . preventive maintenance to pay.



H. J. VON BROCK, Pitney-Bowes, Inc., expects:

. . . good maintenance to produce good employee morale.

H. P. SCHRANK, Seiberling Rubber Company, expects:

. . . maintenance to be more than just a fix-it crew.

F. H. FANNING, Armco Steel Corporation, expects:

. . . delay-free operation that doesn't cost too much.

A. J. SNYDER, Morse Twist Drill & Machine Company, expects:

. . . equipment to be kept running, in a clean, safe plant.

FRANCIS J. TRECKER, Kearney & Trecker Corporation, expects:

. . . maintenance to anticipate repair needs of the plant.

DR. R. E. GREENFIELD, A. E. Staley Mfg. Company, expects:

. . . 24-hour-a-day operation of production equipment.

W. G. DOLLMEYER, Toledo Scale Company, expects:

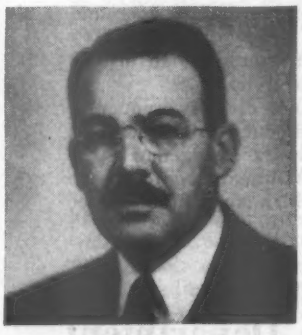
. . . quality and economy in production from maintenance.

J. A. OPENSHAW, Stanley Home Products, expects:

. . . five responsibilities from its maintenance department.

P. K. SHOEMAKER, H. J. Heinz Company, expects:

. . . maintenance to justify the expenditures it plans.



H. E. BRITCHER, York Corporation, expects:

. . . sound maintenance to pay a seven-fold dividened.

FAY A. BRAINARD, Hyster Company, expects:

. . . maintenance costs to run to 12% of production labor.

J. H. HORSTMAN, Robbins & Myers, expects:

. . . forward planning to stretch the maintenance dollar.

OTTO MADLIGER, Victor Adding Machine Company, expects:

. . . better morale, greater productivity through maintenance.

What Management Expects for Its Maintenance Dollar

▶ **To gage whether it is getting its maintenance money's worth, management needs to have a clear idea of what to expect.**

▶ **And to tell whether they are doing a good job, the maintenance heads need to know what their companies really want from them.**

▶ **So, as a guide to the practice of progressive companies, FACTORY asked 14 plant management men how they tell whether maintenance is doing a good job. Their replies are on the next six pages.**

MORSE TWIST DRILL EXPECTS:

Production Equipment to Run in Clean, Safe Plant at Minimum Cost

By A. J. SNYDER
Vice President and General Manager
Morse Twist Drill & Machine Company, New Bedford, Mass.

First, I expect the maintenance departments to keep production machinery in continuous and efficient operation at all times—and to repair emergency breakdowns speedily and efficiently.

To do this job, a maintenance department must: (1) be vigilant in preventive maintenance, and (2) exercise good judgment, be fast to correct breakdowns that do occur.

Second, I expect the maintenance departments to bring about good housekeeping and safe working conditions throughout the manufacturing buildings. This includes the maintenance of the buildings themselves and the safe and efficient arrangements of the manufacturing machinery in them.

Third, I expect the maintenance departments to so schedule and plan their work as to keep costs at a minimum.

Costs of the maintenance departments' work will fluctuate widely as the personnel in the plant varies from experienced to inexperienced help. But I feel that much can be done along the lines of scheduling and planning to cut overtime.

Also, I expect the maintenance departments to take care of any large-scale moving operations which might be laid out by the engineering department—and to do so with a minimum of interference with regular production.

YORK CORPORATION EXPECTS:

Sound Maintenance to Pay a Seven-Fold Dividend

By H. E. BRITCHER
Assistant to the General Works Manager
York Corporation, York, Pa.

How important is good maintenance? Recently we analyzed the causes of difficulty in a factory department which was producing below its schedules and whose costs were higher than their standards. We found that a third of the problem was directly or indirectly tied to the need for a proper maintenance organization. Beyond that we found that when the maintenance problem was straightened out, the quality standards in the department rose.

The Benefits. Here is what we can expect from a sound maintenance program:

1. Higher production with the same machine tool investment, since the machines on hand can be kept operating to capacity.
2. Fuller utilization of direct labor because of less downtime.
3. Good product quality at a minimum of setup expense.
4. Greater employee and plant safety.
5. Lower maintenance and repair costs.
6. Smaller inventories of parts.
7. Less need for production surge areas and thus the diversion of valuable plant space to production uses.

Definition Essential. Maintenance should be just what it says. The only regular duty of a maintenance department should be to maintain equipment and buildings that are in their proper place on the premises.

True maintenance must be divided into at least two major sections (1) preventive maintenance and (2) emergency maintenance.

To do these two jobs right, you need an organization which is split into two groups.

If the preventive maintenance crew is frequently diverted to take care of emergency breakdowns, it will gradually be absorbed into the emergency repair group. As this happens you will again approach the breakdown basis of repair—which is not maintenance at all.

SEIBERLING RUBBER EXPECTS:

A Maintenance Department to Be More Than Just a Fix-It Crew

By H. P. SCHRANK
Vice President in Charge of Production
Seiberling Rubber Company, Akron, Ohio

In many plants, maintenance is too often a stepchild—a "fix-it" department, called in when there is trouble, forgotten when things are going smoothly.

A good maintenance department is like a combination fire insurance underwriter and fire department, with emphasis on insurance. At Seiberling Rubber Company, we try to consider it in that light; we give our engineering department proper authority to keep things running smoothly, often at the expense of immediate production we may need badly.

In this way, we have been able to avert many major breakdowns which would have stopped production in our plant either entirely or in part.

At times it has been difficult to make the decision to stop a machine which is producing goods our customers need immediately. But we have usually found it the least expensive thing to do. This is because we *controlled* a stoppage which would have happened anyway.

We must have a well-laid plan of preventive maintenance. Thus we can take advantage of every moment when a machine is not running, to keep it in running order.

A machine breakdown means more than just the immediate loss of the output of that machine. If it lasts any length of time, workers in many departments may go on costly waiting time, or may be

sent home. Output drops all along the line. Maintenance specialists or tradesmen may have to be called out of bed to work long hours at premium pay, to make a repair that could have been prevented.

These are some of the reasons we give careful attention to our maintenance function. We set goals for cost reduction, but they are like the apple tied to the horse's nose; we will never reach them. We have made some encouraging strides, but we hope to keep on improving—indefinitely.

We try to instill in each maintenance worker the *desire* to avoid stoppages and breakdowns. We tell them to report any faulty condition they see on any piece of equipment in the plant—whether or not it happens to be their responsibility, and whether or not they are working on that piece of equipment.

How We Control Costs. We keep a set of ledgers in which we tabulate the cost records of each type of machinery in each department by the month.

Then we publish a cost-analysis bulletin, which is distributed to foremen when the figures are in. This shows increases and drops in costs, and points up the changes from the previous month.

The maintenance foreman explains to the plant engineer where an increase occurred, and why. This has served as an incentive to foremen to keep a close watch on expenses that can be controlled.

Our maintenance engineers are responsible for recommending a change of equipment or design if a particular machine breaks down too often.

For example: If a motor burns out repeatedly because of overload, it's the maintenance engineers' job to tell us that a larger motor is needed. This is often an important factor in keeping costs down.

On a dollars-and-cents basis alone, we advocate capital expenditures which are justified by a saving of maintenance expense. The plant engineer and his staff have a simple formula for deciding when the costs justify such expenditures.

They keep careful records of maintenance costs on every machine in the plant. These are compared with the charge for the amortization cost of the same machines over a given period. When maintenance expense begins to overtake the cost of the machine itself—in other words, when it is clear that it would be cheaper to replace a machine than to keep on paying for repairs—we order the replacement.

Incidentally, we find these capital expenditures occurring sooner than they used to. This, of course, is caused by higher labor and material costs. Replacements which at one time were not justified become necessary; we are always rechecking jobs we decided were not justified only a year or two ago.

True Maintenance. We believe that costs of real maintenance should be kept separate from other work done by maintenance employees. In our plant, maintenance men change tire building drums, molds, adjust vulcanizing temperatures, and perform other duties which are not real maintenance at all—in other words, not caused by anything wearing out.

By listing these costs apart from real maintenance expense, we can show a true cost-of-maintenance figure. It will rise and fall with production volume and the quality of our maintenance work. This is the figure we watch—the one we try to improve.

TOLEDO SCALE EXPECTS:

Preventive Maintenance to Pay Off in Lower Cost of Production

By W. G. DOLLMEYER
Vice President in Charge of Manufacturing
Toledo Scale Company, Toledo

Preventive maintenance properly planned and controlled will bring these benefits: a substantial drop in lost time, a resultant gain in productive hours, and a longer life for buildings—all of which means lower final operating and product costs.

This philosophy has worked at the Toledo Scale Company.

We have established a general maintenance policy: "Preventive maintenance is more economical than emergency repair." We carry it out by a regular inspection cycle for all buildings and equipment.

It has been our practice to keep all of our facilities, including equipment, in top condition. This has required replacement of outmoded equipment when: (1) its maintenance costs have become too high, or (2) it couldn't turn out the quality of product at the rate required.

We have also cut our machine maintenance costs by standardizing, where possible, on certain types or makes of equipment. Thus we need fewer repair parts, and our maintenance men can become more skilled in taking care of our equipment. That means fewer breakdowns.

HYSTER EXPECTS:

Maintenance Costs to Run About 12% of Production Labor—If Not...Why?

By FAY A. BRAINARD
Assistant to Vice President and General Manager
Hyster Company, Portland, Ore.

Good maintenance occupies a large part of management thinking in my company. Good maintenance is absolutely necessary to produce a quality product at the lowest possible cost. We expect our maintenance department to do its part to achieve that goal.

Aim and Achievement. The maintenance program at Hyster strives for clean, well-lighted, and properly heated working spaces and a minimum of power outages and breakdowns of equipment.

A breakdown in our plant can materially change our production scheduling. A power failure or burned out motor can delay that schedule. Poor maintenance of buildings causes not only spoilage of materials but inferior workmanship, poor employee morale, and low output.

Preventive maintenance schedules have been set up. For the lubrication, cleaning, and oiling of ma-

chine tools and electric motors, a card system and register book have been in operation for about three years. Because of this strict schedule of inspection, lubrication, and repair, we have had no power outages and few machine breakdowns during this time.

Maintenance Cost Control. We regard all the maintenance and repair of our buildings as fixed costs.

As for our machine tools and equipment: We have discovered through the years that our maintenance costs vary in direct proportion to production labor costs—that the cost of maintenance labor and materials is approximately 12% of production labor. If the monthly reports show that the cost of maintenance is appreciably below or above this figure, we find out why. It's our signal to investigate.

Each year a report is made on each piece of equipment showing the total maintenance cost of that machine for the year. Items that show a high cost to keep them in good repair are examined; a study is made to see if the machine should be replaced.

Any maintenance work on any machine or mechanical device requiring longer than 15 minutes is reported and filed under that particular machine number. We compile this information regularly to help in making decisions as to the type of equipment to be bought when major overhauls are necessary—or when equipment has to be replaced.

A Matter of Attitude. We require of our maintenance department that it key its thinking to production planning—in the maintenance of both fixed-cost and non-fixed-cost items.

Most maintenance departments can improve their efficiency simply by setting up and maintaining regular schedules of inspection, servicing, and repair—and by compiling complete data on all items so that accurate decisions can be made. Above all, they should shake off the tradition that a maintenance man is some kind of a janitor. They should think in terms of increased production because of better maintenance.

Thus, also, should top management view the function of a maintenance department.

H. J. HEINZ EXPECTS:

Maintenance to Justify Expenditures It Plans

By P. K. SHOEMAKER
General Manager, Manufacturing Division
H. J. Heinz Company, Pittsburgh

Top management is always in favor of adequate maintenance. The test of its good faith is in its willingness to support maintenance when it costs money. Top management is also objective and can be sold, but it is important to have a carefully prepared justification for the program.

When we ask our executive committee to spend money for maintenance, we expect to be able to justify it. Here is our procedure, in brief:

All appropriations originate at the level and location where the installation will be made or the changes take place.

All proposed expenditures should be arranged so that it is easy to see what part is capital investment and what part is expense. (In many companies, the amount of money that men in management positions are permitted to spend is limited to one amount for capital expenditures, and another—larger—amount for expense.)

Each expenditure proposal must cover a complete project. It must include an estimate of all labor, material, equipment, engineering, and purchased services involved in all of the separate work orders or purchases for the entire project. This will include the cost of tearing out or removing assets replaced—as well as the cost of the new assets plus installation costs.

A. E. STALEY EXPECTS

24-Hour-a-Day Operation of Its Production Equipment

By DR. R. E. GREENFIELD
General Superintendent
A. E. Staley Manufacturing Company, Decatur, Ill.

In the wet milling industry, "normal" operation of a factory calls for 24-hour-per-day production over extended periods of time.

So the main goal of our maintenance program at A. E. Staley must be maximum use of our production facilities. We must be concerned, of course, with what that maintenance is costing us. But the number of hours we are able to run our plant and the number of bushels of corn and soybeans we are able to grind take priority over all else.

Here's how important maintenance is in our total operation. One out of every four on our hourly payroll is a member of the maintenance department.

Prevention. Our interest is primarily in preventive maintenance. Breakdown repair, no matter how speedy and efficient, is not enough in a wet milling plant. The man-hour and production losses caused by breakdowns cannot be recovered.

Continuous production places a terrific strain on our equipment. Faults must be found and corrected before they result in costly breakdowns. That is what we expect from the maintenance department.

This question must be answered mainly in terms of the kind of production we receive from our plant. We know from experience that continuous operation of our plant at capacity for long periods results in higher output and lower unit costs. We must be certain of that kind of performance from the maintenance department.

Controlling Costs. In our highly competitive industry, maintenance must also meet the test of cost. We can't get into the position of operating our plant solely to support a maintenance department. Careful analysis of the information we receive on job-order tickets gives us some basis for determining whether a job has been done as economically and efficiently as possible. Man-hours and material expended can be checked and the reason for delays investigated.

Responsibility for the original estimate of performance by our mechanics rests with the supervisor on

the job. Results of such judgments are spot-checked by time-study specialists. We realize that the success of our system depends to a large degree on uniformity of thinking among our supervisors. Our goal is to collect enough actual job information to set up some standards of maintenance performance.

We do know this: Too little maintenance can be more costly than an apparent surplus in a period when customer demand calls for a maximum effort by our plant.

PITNEY-BOWES EXPECTS:

Maintenance to Produce Good Employee Morale

By H. J. VON BROCK
Assistant to the Vice President, Manufacturing
Pitney-Bowes, Inc., Stamford, Conn.

Good appearance of our plant and equipment is necessary for good morale. Employees take pride in working in a plant that is attractive. And their efficiency rises when they are contented and comfortable in their surroundings.

For good maintenance we need:

1. An efficient, loyal head of the maintenance department who takes pride in having everything in good order.
2. Proper control of the purchase of maintenance supplies.
3. Care in keeping the maintenance department informed of over-all company policies—such as expansion programs, acquisition of new equipment, plant layout plans.

VICTOR ADDING MACHINE EXPECTS:

Well-Run Maintenance to Raise Productivity, Aid Industrial Relations

By OTTO MADLIGER
Works Manager
Victor Adding Machine Company, Chicago

A well-run maintenance department earns its way by protecting the investment in buildings, machinery, tools, and equipment. It boosts morale, makes for operator efficiency, means a better product.

Set Up to Do the Job. As we see it, a maintenance department is just that—it *maintains*.

Maintenance work is as definitely scheduled as production. A budget is set up. Routine work is done at hours when it will cause the least disturbance.

Routine maintenance is pretty much an established list of inspections, repairs, and reports. For instance: Close checks are regularly made on all safety equipment, machine guards, elevator cables, power cables, electrical connections. Whenever faults are found, they are corrected as soon as possible, to avoid more difficult or expensive repairs later. During these inspections, it is quite natural that the condition of machinery, tools, or equipment will become evident. The recommended repairs or replacements are put on the schedule for future handling, in order of priority.

To make certain that we are getting the highest rating out of our equipment, daily records are kept. Loss of efficiency will show up quickly.

We give our maintenance department the best time-saving and labor-saving devices available. For example: Floor washing machines, floor polishing equipment, and automatic floor markers speed up the work and do it better.

The Payoff in Results. What should good maintenance cost? Is it too much? Is it too little? Is it profitable? These questions can be answered only if you know what results are obtained from good maintenance.

We at Victor know what our maintenance costs are. We know we do not spend too much. We know that what we do spend is profitable in dollars and cents—plus rewarding us handsomely by boosting our employee relations tremendously.

We have an exceedingly low employee turnover in all departments, thus reducing hiring and training expense. We have never had a mechanical shutdown due to failure of machinery or equipment. Our plant has a reputation for quality manufacturing in a well-kept, clean, and orderly plant. We are getting our maintenance money's worth.

ROBBINS & MYERS EXPECTS:

Planning to Stretch Maintenance Dollars

By J. H. HORSTMAN
Vice President and Factory Manager
Robbins & Myers, Inc., Springfield, Ohio

Good maintenance pays off by preserving the useful life of the equipment.

The replacement cost of machine tools today is considerably greater than at any time in the past. Most plants have a normal policy of buying new replacement machines to the extent of the depreciation reserve set up. But, due to the much higher cost of new machines today, this reserve is often inadequate. So it becomes imperative to preserve our equipment as long as possible.

Dollar Stretching. Many times you can make your maintenance dollar go further by planning further ahead. For example: A frame warehouse required painting every four years at a cost of $1400. A survey showed that the cost ($3400) of putting on permanent-type insulating shingles, prorated over the longer life, would be less expensive than painting every four years. Also, heating costs would go down 10% to 20%.

The following figures tell the story:

Painting cost prorated yearly	$350
Est. savings on heating cost (17%)	$400
Total estimated yearly savings	$750

Since the cost of permanent-type shingles would be

$3400, these savings ($750 per year) represent 22% on the investment. Savings would pay for the improvement in less than five years. The life of the shingles would be, at the very minimum, 20 years. Assuming this life for the shingles:

20-year savings on painting and heating ..	$15,000
Investment for shingles	3,400

That is the kind of planning that saves maintenance money—and still gives good maintenance service. That is what we expect for our maintenance dollar.

STANLEY HOME PRODUCTS EXPECTS:

Maintenance Department to Fulfill Five Big Responsibilities

By J. A. OPENSHAW
Plant Superintendent
Stanley Home Products, Inc., Easthampton, Mass.

Industry expects more of the maintenance dollar today than ever before.

Manufacturing is becoming an automatic operation with machines and installations of complicated designs. The operators are production-minded men, not trained to diagnose trouble and make necessary repairs and adjustments as in past years. These people are usually piece workers, or are working under a group incentive plan. *Production* is their goal. Quantity in production gives them more take-home pay. They can't get quantity output unless their machines are in top-notch condition. So responsibility for the workers' take-home pay (and the profits of the company) rests squarely on the proper maintenance of equipment. Here is what that means in our plant:

1. The maintenance department is responsible, with the engineering department, for seeing that proper and modern machines are installed throughout.

2. Maintenance must have the vision and engineering knowledge to make improvements on plant and machines.

3. It must have intelligent preventive maintenance men.

4. Maintenance must be able to diagnose trouble quickly and make all manner of repairs—temporary and permanent. This calls for planning in the spare-parts department and ingenuity in making unobtainable parts.

It is the responsibility of the maintenance department to see that all machines are safe. It is not acceptable today to have partially safe machines. All known safety measures must be inaugurated and used 100%. On this there can be no compromise.

Management's Obligation. Considering these responsibilities, it is clear that maintenance men should no longer be classed as repairmen or third-class workers. So much depends on the maintenance of machines and plants today that the work demands men of only the highest skills—rated accordingly. No plant can succeed in today's market with a rundown, poorly managed maintenance department.

Many companies today do not recognize the importance of the men in the maintenance department. Sufficient funds are not budgeted for them. Too few men are trying to cover too much territory with improper tools and poor supervision.

Mechanized Housekeeping. Plant housekeeping has become more important of late. Housekeeping well done means clean, safe working conditions. It raises the morale of the workers and gives them pride in their plant and equipment.

Housekeeping work should be done by alert men who take pride in their clean plant. Such men cannot be recruited from the ranks of the failures in other departments.

To obtain the right men, we must discard the old corn broom, being pushed by a slovenly individual in filthy overalls. I say: "Mechanize the housekeeping." Better men can be hired when a man is given a chrome-plated, electric floor-washing machine instead of a heavy pail and a dirty mop. Besides, modern equipment will clean a larger floor area better. Machines should be installed and new buildings planned so that mechanized equipment can be used effectively.

A good-equipment policy pays off all along the line. We have found that it is wise to buy the very best of motors, pumps, controls, valves, etc. These save time and increase production. The extra price paid for a totally enclosed motor is nothing compared to an hour's shutdown on a production line, due to failure of a cheaper motor.

KEARNEY & TRECKER EXPECTS:

Uninterrupted Production Through Anticipation of Repair Needs of the Plant

By FRANCIS J. TRECKER
President
Kearney & Trecker Corporation, Milwaukee, Wis.

We expect to get from our maintenance dollar a clean, well-lighted shop and office, filled with busy equipment in good repair.

Since productive man-hours have become so comparatively high priced, it is essential that machine shutdown be cut to the minimum. This can be done only by having the maintenance department: (1) anticipate the need for replacement parts, and (2) schedule the repair jobs for a time when production will not be affected.

Our maintenance department is separated into four divisions. Each is headed by a foreman who has had considerable training in leadership as well as in the crafts under his supervision. The foremen have their headquarters in one large shop office—together with a job dispatcher, a clerk, and the maintenance manager, Warren Clark.

We have a budget for each maintenance division, brought together into a department budget. Naturally, with fluctuations in material and labor costs and the constant aging of buildings and equipment, the line must be revised from time to time. However, we feel that the budget is like the hand rail along a dark stairway: We would hate to let go of it.

ARMCO STEEL EXPECTS:

Delay-Free Operation That Costs Not Too Much— Not Too Little

By F. H. FANNING
Vice President in Charge of Operations
Armco Steel Corporation, Middletown, Ohio

What we expect for our maintenance dollar is "results." I mean benefits clearly measurable in terms of dollars and in units of production.

If we could isolate one department in case of breakdown, and go on with normal operations in the other departments, maintenance would not receive the attention that it does. But today we have to keep a continuous flow of products through each operating unit. Good maintenance is a must.

The change from slow-speed, hand-operated equipment to high-speed, automatic equipment also has made the maintenance department more important. For example: When we rolled our steel on hand mills, one mill could be down for repairs without seriously affecting our over-all production. Today we roll most of our steel on high-speed continuous strip mills. A broken roll, for instance, in a unit of this type means astronomic losses for every minute of downtime. We really depend on our maintenance department to keep us rolling.

Two-Way Approach. Our program reflects our preventive maintenance philosophy in two ways: (1) in the selection of equipment, and (2) in our daily maintenance practices.

We choose equipment designed to out-perform what the actual job calls for. In other words, we give ourselves a safety factor. The initial cost may be higher but we are convinced that this differential is more than offset by lower maintenance costs—and, more important, by less downtime. Further, we install this equipment with precision methods. The extra time and effort will pay off in longer life for the equipment and in less maintenance.

Our preventive maintenance program calls for daily equipment inspection by a trained inspector. Defects, or conditions which might lead to defects, are found and attended to.

We recognize that even in the best regulated maintenance families, breakdowns will occur. When they happen we want to learn from them.

Watching Costs. Regardless of how essential we consider maintenance to be, we expect that it will pay its own way. We watch and control costs carefully.

Our records should show not only the total maintenance cost but also the unit maintenance cost. We keep repair logs covering all repairs made on each major piece of equipment. This gives us a ready reference to the amount being spent on maintenance for each item. If frequent or costly repairs are being made, we discover the fact and do something about it promptly.

Then there is the other side of the picture: We may be spending too little money on maintenance of a particular unit. We guard against this by having a regular and thorough inspection of all equipment by a competent engineer. Such a check is a good safeguard against destruction of equipment due to improper or inadequate maintenance.

Somewhere in between too much and too little maintenance is that optimum point for which all good maintenance men strive.

The only way we have found to approach this point is to study maintenance costs by comparison with previous periods—in total dollars and unit costs. Such a cost comparison *must* be accompanied by a production performance record and a close inspection of equipment condition.

THEW SHOVEL EXPECTS:

Preventive Maintenance to Pay If You Know the What, When, and How

By W. J. ALLABACK
Plant Manager
The Thew Shovel Company, Lorain, Ohio

Factory executives believe in maintenance—but some of us just don't get around to doing anything about it until a serious situation has developed.

During more than 50 years of business, we at Thew have been in that situation in the past. Today we have a definite and planned preventive maintenance program covering all of our facilities—machine tools, buildings, roadways, storage areas, and the like. We believe that it is far more economical to take care of minor adjustments promptly than wait for a major breakdown to stop perhaps our entire production.

The Long View. Here's an example of our long-range planning: We have a projected painting program that will carry us through 1965 for all buildings, inside and out, fences, etc. The planning of this program is on a yearly basis so that we may know just what is to be done each year, what its approximate cost will be, and how many men we'll need for each project.

Along these same long-range lines we have a 5-year program covering our machine tools. From this we can tell you which machines are to be rebuilt and when; which machines are to be replaced and when. The thinking has all been done. All that's needed is action at the proper time.

It Pays. These are examples of how we have implemented our basic belief that preventive maintenance pays. We believe it *does* pay when you have a definite program that tells you *what* you're going to do, *when* you're going to do it, *how* you're going to do it, and what it will cost. Without this, our slogan of "Preventive Maintenance Pays" would be more like "The Company Pays—and Pays—and Pays."

Turn the page to read what progressive plant engineers prescribe as the best in maintenance — for companies that really want to get their money's worth. ——▶

HOW TO GET YOUR MAINTENANCE MONEY'S WORTH . . . begins on page 81

What Plant Engineers Prescribe as the Best Way to Get Good Maintenance

OUR QUESTION —addressed to ten plant engineers—was: "If you were handed a blank check and could write your own ticket, what steps would you take to make sure you were getting the best possible maintenance? In other words, what's *your* conception of the 'ideal' program?"

THEIR ANSWERS are published in the next thirteen pages. They are based on good practice in nine different industries—machine tool, chemical, textile, rubber, radio and television, aircraft, meat packing, electrical manufacturing, and pharmaceutical. We believe they will give you ideas you can use to improve your own company's program.

"Good men, good tools, good planning"

says **E. A. MUNSON** • Plant Engineer, Gould & Eberhardt, Inc., Irvington, N. J.

E. A. MUNSON

MY ADVICE to a maintenance engineer who wants to organize an ideal program is to ask himself:

Do I have trained men?
Do I have good tools?
Is my work planned?

If your answer to any of these questions is *no*, you have a weak link in your chain that is costly to your company and yourself.

Good Men • All too often maintenance is considered just a "necessary evil." The department becomes the catch-all for discarded men and machines. You can't afford to let this happen to your department! A subnormal employee still shows up on your manpower budget as one full employee.

Maintenance men should be fully trained and generally more competent than the average production worker. They have to face situations where they become managers and must organize and make decisions that can be costly in dollars and safety.

Try to hire skilled mechanics. Assign them specific duties. Suppose, for example, you have major equipment such as a baking oven, power conveyor, air conditioning equipment, or any other production equipment likely to require periodical servicing or adjustment. See to it that one of your mechanics is fully instructed (when the equipment is installed, if possible) and made responsible for its continued operation. This will pay dividends when breakdowns occur or adjustments have to be made.

It is sometimes a good idea to have another man trained to take over if the No. 1 man is not available. However, be sure you pick the right men. You certainly don't want to create a group of prima donnas. The men should be trained to be flexible and versatile enough to take over the other fellow's job when necessary. In fact, alternating the men sometimes stimulates ideas and suggestions which should pay off to the men, to the company, and to yourself.

Good Tools • Your second goal is tools. Have the right tools and enough of them. Investigate your tool stock. Discard worn-out, obsolete tools. Replace them with up-to-date tools. There are numerous tools available that are big time-savers. The investment for a tool may not necessarily pay off on the first job. But most tools, even special tools, are eventually needed again. I can't recall buying a tool that we haven't found to be a good investment. Your men will appreciate new tools. The fact that you are tool-conscious shows them that you are concerned about job cost and the kind of work they do. The over-all effect is that you get more work done quicker and better.

For example, we recently had to do a roof-coating job of about 1800 squares. If done by an outside contractor, it would have cost us about $12,000. We investigated and finally purchased a special pump and spray outfit at a cost of $600 which enabled us to do the work with our own crew at one-third the cost.

Good Planning • The third step of your program should be the planning of your work. Make a survey of your plant. List all items that require service. Group them according to the service required and the frequency. Some equipment may require only annual or semi-annual servicing. Other equipment may require daily servicing. Analyze every item of equipment for the type of servicing, the time it requires to service it, and the frequency of the servicing. Instructions should be written describing materials,

"First an inventory of equipment"

says **C. B. MUIR** • Supervisor, Plant Engineering, Canadian General Electric Company, Peterborough, Ont.

C. B. MUIR

SHOULD WE BE ASKED by a young engineer, about to take a position as plant engineer, for the basic principles of a good plant engineering organization, with particular emphasis on maintenance, we would stress the following points. This outline is based on our own experience at Canadian General Electric, which has approximately 4000 employees and manufactures a variety of heavy electrical equipment.

Equipment Inventory • One of the first things you need is a complete inventory of all capitalized equipment. If it is not available, make it, and see that a method is set up to include new equipment as installed. A good method of collecting information as equipment is installed is to make it the responsibility of the department that does the work.

The information is recorded on sheets or cards and filed under the tool or machine number.

A complete and well-edited record sheet or card includes the description of the equipment; type; serial number; maker; vendor or agent; purchase order number, and motor tool number. Space is also provided to record the initial location of the unit and all subsequent changes. Room is allowed for all drawing numbers pertaining to the equipment.

A section is allotted to electrical data, which in-

cludes the motor and control ratings and any electrical accessory equipment. Temperature and pressure control data can also be recorded in the electrical section. Mechanical accessory equipment is also recorded.

Expenditures are shown. Under this item, we suggest entering the date of installation, account number, purchased cost, and installed cost complete. Maintenance expenses are also shown, including date of expenditure and account number.

We recommend that the sheets or cards be filed consecutively, regardless of department. All plant engineering departments get numerous telephone requests for equipment information; if you can supply it without calling back, you save time and create a good impression.

The function of the record sheets can also be improved by compiling an index of equipment by class or type. Items can be located in the files when the tool number is unknown. The index also provides an easy way to find out the total number of units of any particular item.

All drawings, including outlines, foundations, wiring, and controls, are filed under the tool number of the equipment, regardless of the department in which the machine is located. Renewal parts bulletins and instruction pamphlets can also be included in this file. Every effort should be made to have duplicate copies filed in the service departments. The files must be as complete as feasible. Papers should not be removed without a record. Information on miscellaneous small equipment, not bearing a tool number, can be filed alphabetically under the name of the item.

Estimating • This is done on a form showing the article or material, quantity, unit price, and total cost. Space is provided for the name of the person making the estimate and the date on which it was made. Copies of the estimate are sent to the department requesting the information in sufficient detail to show how the costs are arrived at. Estimate sheets are particularly valuable for reference where overexpenditures have occurred and where it becomes necessary to ask for an additional appropriation.

Ordering • This form includes all items necessary for the installation. It covers all equipment necessary to make the installation, except general supplies. And it contains sufficient information to enable the service department to make the complete installation. All drawing and wiring diagram numbers are shown, as well as location and other pertinent information.

The order form also shows tool numbers, vendor and order numbers, quotation costs, shop order or expense number, and department for which the equipment is being purchased. Also shown is the date the form is issued, date the material is needed, total estimated cost, and name of person issuing the form.

Accumulating • We suggest that an area be provided where all incoming material in connection with installation and maintenance can be accumulated and stored under its work order number. Such a section can be part of the general supply stores where it becomes the duty of the accumulator to receive both types of materials. When material is available to start a job, the accumulator notifies the plant engineering department.

We should like here to stress the importance of a general supplies storeroom for both installation and maintenance. By general supplies we mean all materials that are usually ordered in bulk and are continually being used. Wiring devices, pipe fittings, tools, cutters, cleaning supplies, etc., are classed as general supplies.

Installing • It now becomes the duty of the plant engineering department to advise the service departments involved that the project is ready to start.

One method of transferring this information is for the plant engineering department to issue an order card that outlines the work to be done and indicates the time to start and finish the job The card also shows the work order number, account number, and estimated costs. All tool numbers to be applied to the equipment are shown.

Replacement Parts • Some method must therefore be devised to make sure that an adequate supply of replacement parts is kept in stock. A simple way is for the plant engineering department to compile a list of necessary parts and vendors.

In addition, tool and serial numbers appear on the list, as well as an indication of the number of parts to purchase on the original order. A copy of this list is sent to the plant supplies stores, service departments, and to the manufacturing departments involved. It is now the responsibility of the stores to order the recommended parts and to replace the stock as the items are used. The rate of usage determines the quantity on subsequent orders.

Maintenance Instructions • In the past, a good service man could attend to maintenance without specific instructions. Today he should have assistance to help him perform his work on equipment of a complicated design.

Practically all manufacturers issue instructions on how their equipment should be operated and maintained. Yet it has always been a problem to find a satisfactory way to distribute this information to the shop. We recommend setting up an instruction bulletin which not only contains maintenance instructions, but also plant engineering department routine, and operating and installation instructions.

All plant engineers will on occasion read articles or come across diagrams in magazines that can be used in setting up standards. This kind of information is also supplied by vendors of equipment. We think it is so valuable that a method should be set up to accumulate and issue it to service departments.

For instance, it was original practice in our plant to make hoods for exhaust ducts as each tinsmith felt inclined. This resulted in a variety of hoods, few of which were of good design. Since setting up a standard, all hoods are built to one design, which has a good appearance and performs satisfactorily.

Maintenance Control • A suitable form for maintenance control includes identification of equipment, machine number, its department and location, maintenance interval in months, maintenance instruction, and space for entering date of issuing and completing the order.

The forms are reviewed at the beginning of each month, and orders issued as determined by the

maintenance intervals. Frequently it is desirable to do certain maintenance work at a specific time in the year. This can be shown on the form; when that month comes, orders are automatically issued.

We do not recommend using this method to control maintenance that occurs oftener than once a month. And we suggest that the service departments be allowed a month to complete all orders issued for that month.

Lubrication • This work is often part of the duties of the machine operator. Such practice may work out satisfactorily in a small plant. But in larger shops we think it is vital to do this work independently. The lubricating section should be supplied with portable equipment. A schedule should be set up to do the work regularly. Where feasible, it is a good idea to cover a department or section completely rather than lubricate one class of machines at one time and then return later to lubricate another type.

Centralized lubrication deserves consideration. Where practical, new equipment should be ordered with this included. It is also a good plan to study existing equipment to take advantage of the benefits offered by this method of lubricating.

Equipment and tools • For some unknown reason it is often the practice to equip service departments with machines and tools discarded by the manufacturing departments. Except in a few cases we think this is a mistake. Maintenance labor is generally near the top of the scale. Work is often done on overtime at premium rates. It is so important to get the machines into production again that the maintenance departments should be equipped with up-to-date tools.

The maintenance departments should be as self contained as practical and not have to depend on a manufacturing department. It is impossible to do a satisfactory job of maintenance if you have to follow your work through another department.

Location • The need for a central location is obvious. In larger production departments, you may find it practical to establish smaller maintenance sections which service those departments only. This subdivision is particularly desirable if the manufacturing department has special equipment peculiar to that department.

Transportation • We recommend hand platform trucks, each with a small stationary drill, pipe-threading machine, vise, angle-iron benders, and compartments to hold portable tools and general supplies. These trucks eliminate the need of going to and from the main department for certain work; they cut down time necessary to complete the job.

Buildings • Because of the large capital expenditures involved buildings demand careful maintenance. One of the main items is roofs, especially in climates which experience severe winters.

Some sort of record or history is necessary to keep account of the work done. We recommend a survey of all roofs at least once in the spring and again in the fall to record conditions and plan whatever repair work may be necessary.

It is usual to apply bonded roofs and in a large plant it is difficult to know exactly the area covered by each bond without some means of identification. One way to solve this problem is to make a drawing of the roofs and show on a white print the various sections covered by each bond.

Painting is another important function of maintenance on buildings. All that is necessary here is a record of the work done, plus regular inspections to insure that sections are not being neglected.

To sum up: All the above says nothing about such functions as layout, fire protection, patrol, materials handling, etc. Add them and you find there is plenty to keep the plant engineer busy.

"Analyze plant, conditions—and yourself"

says H. N. JOHNSTON • Plant Engineer, Philco Corporation, Philadelphia

H. N. JOHNSTON

LET'S GET SOME FACTS straight. The question of an "ideal" maintenance setup should first be considered from the plant engineering viewpoint. Maintenance in industry is not an isolated, unimportant, hit-or-miss function. It is part of the larger function known as plant engineering. And plant engineering is a very important, basic part of plant management.

The term "plant engineering" is not just a glamorous catchphrase. Plant engineering is a genuine branch of engineering. It calls for a basic engineering education and the specialized knowledge necessary for construction, operation, and maintenance of industrial plants. The very definition of the word *plant* is often misunderstood, being vaguely construed to mean buildings. Actually, a plant includes all physical facilities and services necessary for the operation of a business.

You can easily see, then, that engineering problems incident to the construction, operation, and maintenance of such facilities are many and varied. If permitted to drift without competent direction, the results for the plant could be not merely costly but even disastrous.

The plant engineer should be an able, experienced engineering executive. He should be responsible for all engineering problems involving plant facilities—both in design and execution. Sufficient authority for the discharge of these responsibilities should be granted as a matter of management policy. Over-

lapping assignments and functions should not be permitted to violate this fundamental precept.

Second, you must not get off on the wrong foot and think of an ideal setup as a dreamer's paradise. Not so. You must have a realistic ideal. All plant engineering functions must be integrated with over-all plant management. Costs must be reasonable, policies sound, procedures balanced. Only then can a really ideal setup be achieved.

Third, the "necessary evil" aspect of this activity must be eliminated. You must realize that this is not a field for the amateur or the handyman. Too often "goldbergs" are given precedence over more obvious, simple solutions. High costs due to incompetence, bad judgment, ignorance, and indifference have helped to place maintenance in high disrepute.

You must overcome this condition with hard work, and perseverance. Be prepared for little or no appreciation until you have produced results that are beyond question.

Basic Principles

If you are willing to accept the facts outlined above you are ready to proceed with your "ideal" maintenance setup. I think you must build it on the foundation of thorough analysis of all aspects of the problem. Therefore:

Analyze the plant. Have a detailed knowledge of all buildings, services, and equipment. Recognize the most important features—those upon which you must concentrate.

Analyze conditions. Balance your function with other related functions. Recognize divided or overlapping responsibilities. Guard against weaknesses from this source.

Analyze yourself. Build your personal qualifications to serve your company's best interests. You must be an engineer, executive, salesman. You must be technical, logical, economical—and a good administrator.

In analyzing my own organization recently, I came up with an even 60 different classifications of facilities. Each class involved many individual pieces of equipment—not always the same. The inventory involved some 18,000 items, all requiring the application of maintenance techniques. Therefore, it is not possible to discuss actual applications in an article of this kind. Besides, no two plants are alike. Specifications for one would not apply to another. Yet it is possible here to highlight the features to which I would give attention in building a successful program:

Major Functions

Preventive Maintenance • Organize a strong routine inspection system. Give full attention to all items, but concentrate on the important features. Don't let it slide. Insist on a strict schedule and complete reports. Don't overlook contract maintenance services.

Good preventive maintenance won't eliminate emergency services, but it helps. Organize a staff of expert mechanics to move in fast when trouble occurs. Have a competent dispatcher to avoid delays in getting the job started.

Construction • Organize shop and field crews to handle essential construction as related to your product. Be competitive—don't overload. When unusual needs arise, seek professional services at the highest levels.

Power System • Continuity of production depends upon a reliable power supply. Plan it properly and don't neglect it. If you buy power, pay attention to your contracts. Cooperate with the utility company to insure reliability.

Engineering • To the extent that it can be afforded, you need a staff of experts to engineer all projects. Reinforce this with outside services when necessary. Insist on sound engineering right down the line—no guessing or shortcuts. But don't be stuffy about it.

Cost Control • This is management's yardstick—the only language management understands. Be logical about it; it's important. Be budget-conscious, but try to work out a practical budget. Have fixed and variable allowances that will permit you to meet responsibilities at all levels of activity. Develop a system of appropriation that will be practical for you, but will also satisfy accounting needs.

Material Control • During the last ten years material has always been a problem because of war restrictions, peacetime shortages, and now a semi-military economy. Maintain adequate stocks and a complete inventory, charge-out, and distribution system. You'll need purchasing cooperation; insist upon it. Know your suppliers and their reliability. Know your government agencies. Keep abreast of current conditions. Without a strong material control system, you're in for trouble.

Supporting Functions

Here, in brief, are some of the services and functions necessary to support a successful program; you must have freedom of movement in order to make them work to best advantage.

Labor Relations • You have special problems. Use good judgment and be fair. I recommend a sound training program, merit increases, equality of seniority and skill.

Tools and Equipment • You can't do a job without the right tools and enough of them. Only the best will do. You also need adequate space and working conditions.

Transportation • If your plants are scattered, you'll need a good transportation system for men and materials. Have enough equipment and a good dispatcher. Schedule your movements.

Work Orders • If cost controls are sound, a good work order system will implement them. Simplicity, full information, direct routing, and completion reports are essential.

Estimates • Be systematic, complete, and competitive. Make good estimates and live up to them.

Safety • Build it into your designs and into your staff. Safety drives are not wasted effort; they lead to efficiency and satisfaction. Benefits are real, don't overlook this feature.

There are many other items to consider—insurance, security, public relations, etc. If you build on a sound basis as outlined above, these other problems will fall into line.

"Cooperation and good records"

says F. LEOPOLD • Chief engineer, Lee Rubber & Tire Corporation, Conshohocken, Pa.

F. LEOPOLD

FIRST REQUISITE of a good maintenance department is to keep production going at a steady pace.

Plant Engineer. In my "ideal" maintenance program the plant engineer is in charge of all plants and properties. He has under him two men—a chief engineer and a master mechanic. In the smaller plant, one man can take care of both jobs.

Chief Engineer. He is in charge of all engineering work, including the drawing room, all new work, the designing of new equipment, improvements to machinery and equipment, and the keeping of plant equipment records.

Master Mechanic. He is a man preferably with some engineering training, but who is qualified particularly in the handling of men and in the care and repair of equipment. With his engineering training he has a broad knowledge of all the trades involved in his work.

The functions of the chief engineer and the master mechanic often overlap. But in the direction of the work done by the men under the master mechanic, the latter has full say. Under him come all the other maintenance department heads.

In my experience the laborers should include all yard men, general laborers, sweepers, and elevator operators. Millwrights include all plant mechanics —that is, men who do mechanical dismantling and assembling away from the machine shop—and oilers.

Night Shift Maintenance • Where round-the-clock operation is maintained, some provision for night mechanics must be made. The type of men required depends upon the nature of the equipment. Usually a skeleton machine-shop crew is desirable, augmented by electricians and sometimes pipefitters. The number of men needed is only a small part of those on the day shift, seldom more than 20%. This crew should be headed up by a night mechanic, immediately under the master mechanic and responsible to him. His hours should overlap the day shift personnel and extend into the last shift for an hour or so.

The skeleton night crew is adequate because the problems of the night are seldom as serious as the headaches of the day. For major repairs essential to production, the night supervisor calls in the day master mechanic, who then calls in such additional help as the occasion demands.

Trouble Calls • In my "ideal" setup trouble calls are handled promptly and in a routine manner. The best way I have found is to have such calls made to the chief engineer's office where the clerk—who works both for him and for the master mechanic—receives them and calls the proper maintenance department. He notes time, place, and kind of job. When the call has been taken care of, the clerk notes the completion time on the record. If the case is serious, the master mechanic is immediately called on the loudspeaker system. Otherwise, his attention is called to such minor cases either on his next stop at the office or on his next telephone call to the clerk.

Routine Maintenance • Work is handled by issuance of a work order. This originates in the chief engineer's office and is delivered to the master mechanic for execution either at or before a specified time. Similar work orders are issued for any repair call requiring the expenditure of money beyond a given amount ($25 or $50).

New Work • Any new work that the maintenance department can do is also handled by issuing a work order. I'd have the maintenance departments do as much new work as they can handle. However, I feel that only a crew big enough to handle the repair work efficiently should be employed. If the maintenance men cannot do a given new job within a certain time, then outside contractors or help should be used.

Records • In my "ideal" maintenance program, complete records are kept of all equipment in the plant. They include drawings and parts lists, and other pertinent data so that any part necessary could be readily ordered. In addition, on a card attached to the record card I'd keep data as to repairs. An inspection will thus show weaknesses which it is the duty of the chief engineer to correct.

Records are also kept of major spare parts on hand. In a rubber plant they consist of rolls, gears, motors, and other items. The record shows pertinent data on such items and also provides space for the number on hand, when used, when ordered, and when received. Such information may possibly save a protracted shutdown.

The records also include listings of conveyor belting of various specifications and where used. This information avoids, in a large plant, extended inventories and will assist in preventing the use of materials of unusual dimensions when an acceptable substitute is already in use. By combining with this record a space for the place the stock has been used and when, often the need for a better quality of material is obvious.

Similar records are also provided of such other items as chain, both roller and silent, small gears and sprockets, and any other group of mechanical supplies used in considerable number.

Mechanical Stores • In my plan this storeroom is under the maintenance division. All requisitions for such supplies are passed upon first by the master mechanic and then by the chief engineer. In the storeroom, maximum and minimum stocks are set up for each of the more popular items to be carried. A definite system is set up so that related materials are in a definite area. Parts for special machinery or equipment are carried in a definite area in the shelf system, and this location is stated in a brief index at a given place in the storeroom area. If

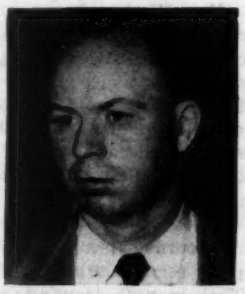
some parts are common to several pieces of equipment, a sign at the storage area for this unit states where such common parts are to be found. This procedure is of untold help, particularly to the night crew. Also in the storeroom area are carried any parts made by the machine shop as well as items purchased outside.

Parts that are repairable are delivered to the machine shop or other divisions that will do the repair work. The foreman of this department examines the part. If it can be saved, he takes care of it promptly. If not repairable, he notifies the master mechanic who then reorders the part. A repaired part is turned into stores and then handled just like a new one.

To sum up: The purpose of a good maintenance program is to keep the plant in operation. By cooperation and the keeping of proper records, improvements are obvious at weak spots. Sometimes this means heavier parts, or better material, but if the result is fewer delays and a longer time between breakdowns, the extra cost is usually worth while.

"My first aim would be control"

says T. A. D. JONES, Manager, Technical Services Division, Kingan & Company, Indianapolis



T. A. D. JONES

IF I WERE ASKED to set up a maintenance program and could write my own ticket, my first aim would be control. Every other phase of our plant operation is controlled. We control purchases of livestock to follow consumer demands. We control production crews to correspond with live stock supplies. We control costs to be able to meet competition. So why not control maintenance operations that are so vital to uninterrupted production?

What does control do? First, it schedules the work. Second, it indicates requirements of maintenance materials. Third, it keeps cost records.

I mention scheduling of the work first because perhaps it is the most important of the three results of "control." Primarily, scheduling means the coordination of the work so that loss in production and maintenance cost is kept at a minimum.

Adequate supplies of maintenance materials are a *must* in any successful maintenance program. Unless some sort of control is established, keeping these adequate supplies is difficult.

Cost records are your yardstick. They measure the crew performance. They make it possible to compare job costs. They establish a basis for making more accurate cost estimates of subsequent work.

How would I establish this control? I'd want a plant engineer who reports directly to the plant superintendent. I'd want this line of authority because plant production comes first. The primary responsibility of the plant superintendent is production. And to get that production he must have active control over maintenance.

Under the plant engineer would come the foremen of the various maintenance crews. Also under the plant engineer would come the storeroom where maintenance supplies are kept and cost records accumulated. With such an organization plan the plant engineer can schedule the work to the best interests of plant production and keep in close touch with maintenance costs.

How a good control plan operates • Let's take a typical case that might arise in a meat packing plant.

Let's suppose that a motor is running hot on one of the refrigeration units in our hog carcass chill room. The department mechanic who is regularly assigned to this area observes this condition and reports it to the department foreman. He, in turn, makes out a work order and briefly describes the work to be done This form consists of the original and three copies. He retains the last copy and forwards the remainder to his section superintendent who, after satisfying himself that the work is necessary, signs the order.

If the trouble is not of an emergency nature, the section superintendent may indicate on the order the best time to shut down the unit so that the temperature in the cooler will be least affected. He then forwards the order to the plant engineer.

The plant engineer, through his maintenance clerk, stamps the order with a number and enters the work order number in his equipment card file. The equipment card has the equipment number of this particular motor and contains data such as make, type, serial number, cost, and other pertinent information. The plant engineer is now in position to scrutinize the order, procure any necessary maintenance materials, and schedule the work to the best advantage.

One copy of the work order is retained in the plant engineer's office. One copy is delivered to the storeroom where it is held so that labor and material charges can be accumulated against it. The original of the order is sent to the shop involved in making the repairs. If more than one shop is involved, additional copies are prepared.

As the maintenance work is carried on each employee on the job reports his time on a daily time and material report. These times are accumulated at the end of the day by the shop foreman on a daily time record and turned in to the storeroom so that all the charges can be applied against the work order.

Materials used in making the repairs are obtained at the storeroom by making out a supply requistion. It is recorded on a summary of mechanic shop charges, along with all labor charges against the job.

At the completion of the job, the shop foreman indicates on the original of the work order the date the job was finished and a brief description of the repair work that was done. The receipt of this original or-

der from the shop foreman indicates that the job is complete and that the labor and material charges can be summed up and entered on the storeroom records for accounting purposes.

After these charges are entered, the original of the work order, along with a copy of the summary of mechanic shop charges is returned to the plant engineer where the description of the work done and the cost are entered on the equipment card opposite the work order number. This provides an accurate maintenance history on each piece of equipment.

When there is an emergency for maintenance work that requires immediate action, the procedure as outlined above can be modified slightly and will work equally well.

To sum up: The system, when strictly adhered to, works equally well on large and small jobs and keeps all parties concerned familiar with what is going on.

It is a workable, down-to-earth control system and one that will pay dividends in reduced maintenance costs and increased plant production.

"I'd pay special attention to these things"

says H. H. HAYDEN • Works Engineer, E. I. du Pont de Nemours & Company, Arlington, N. J.

H. H. HAYDEN

Organization • This is of first importance. The organization reporting to a plant engineer can vary over wide limits, depending upon the type and size of a particular plant. Small plants, for instance, that have 50 to 75 mechanics (or less) could operate with the craft foremen reporting directly to the plant engineer. In such an organization the plant engineer would do considerable detail work himself.

My thoughts are based primarily on maintenance organizations of considerably larger size, where technical assistance is a necessity, and where the plant engineer would be one of the top executives in the plant, reporting directly to the plant manager.

Maintenance departments that have, say, 150 to 300 mechanics or more should be well staffed with capable engineers (call them area engineers, if you want to). Each one would be responsible for specific phases of the work, or specific areas of the plant.

Shops and Equipment • I'd locate my mechanical shops advantageously within the plant. If possible, I'd centralize them. The shops should be on the ground floor. They should be well lighted and ventilated, have ample space both inside and out. I'd make sure of adequate overhead material and equipment handling facilities, good truck loading platform facilities.

Equipment must be up to date. The higher labor rates go, the more important it becomes to have machine tools that will be properly powered so that they can take the loads and cut the labor time.

There are several more or less special tools that a well-equipped shop should have. Here are a few that I have found to be real time-savers: a general-purpose saw for shop work, lock-former for sheet-metal work, spotwelder to eliminate riveting, metal-spraying equipment, flame-cutting equipment. Among the smaller tools: keyway cutters, paint cleaning tools, tungsten carbide drills, electric hammers, impact wrenches, angle notchers and benders.

We now use these special-purpose tools and wonder how we ever got along without them.

Personnel • There is little gained by providing shops with up-to-date equipment unless the men who are to operate it are high-caliber mechanics.

In general, I'd be sure my mechanics came up through some apprentice training system, not via the helper route.

Methods • My ideal maintenance department would have an active methods group under the direction of an engineer with a broad background. Such a group is a real asset to any plant maintenance program. Its activities would be centered around tools that would increase the effectiveness of the department. They would include planning and scheduling of all jobs, planned maintenance programs, pre-analysis of all jobs, preventive maintenance programs, standardization of repetitive jobs, for instance.

I'd make sure that maintenance activities were scheduled from a central point, coordinating work requests with backlog priorities.

I'd study repetitive overhauls of major pieces of equipment. And I'd set them up on the proper frequency basis, with due consideration to proper methods, time requirements, availability of parts, fit allowances, manpower requirements.

Scheduled inspections of major pieces of equipment constitute the essence of a preventive maintenance program. It has been my experience that this type of program can best be worked by starting with a high type of oiler-inspector who during his daily rounds reports any unusual conditions—noises, hot-spots, etc. This program includes, in some cases, partial dismantlement of major equipment to determine the condition of gears, keys, chains, bearings, and so on, so that parts can be ordered for scheduled replacement at some future date.

The usual methods of handling maintenance require considerable paperwork. This in turn takes a lot of time of both supervision and men. There should be some method of practicallly eliminating this.

I guess this is just one of the dreams of a plant engineer that will never come true. But you *can* eliminate a lot of clerical detail by using an *average* maintenance rate in costing mechanical jobs, with no regard for the individual rates involved.

Safety • Generally, if a job is done correctly, it is done safely.

My good safety program would include, and go

much farther than, usual mechanical safety guards, the wearing of goggles and safety shoes, good housekeeping, and so on. You have to train mechanics in safe methods and develop a safety attitude on the part of each man.

Inspection—by competent men—of buildings and equipment, such as hoists, chains, elevators, pressure vessels, ladders, tools, scales, refrigeration equipment, lamps, is a *must* in any good maintenance program. I would put great emphasis on scheduled inspections in my "ideal" program.

Spare Parts • I'd make sure that the control of mechanical stores and spare parts was under the plant engineer, with an up-to-date system of control, including maximum and minimum standards, together with adequate storage facilities in a central location.

Spare parts inventories must not be relegated to a clerk and forgotten. The right man with a knowledge of parts and usage will more than pay his way.

Measurement of Maintenance Work • I'd see to it that the plant engineer had a means of analyzing the over-all progress of his maintenance program. I have used various methods. Since the maintenance department has no control over production schedules—and since maintenance costs do not follow production as a straightline function—I have adopted the relationship of maintenance to capital investment as the most logical yardstick.

"Constant vigil—plus preventive maintenance"

says J. W. TAYLOR • Plant Engineer, Riegel Textile Corporation, Ware Shoals, S. C.

J. W. TAYLOR

THIS IS HOW I'd set up a maintenance program for a textile plant of 75,000 to 100,000 spindles.

The plant I have in mind has some 2000 looms on cotton and rayon fabrics. It includes bleachery, dyeing, printing, and fabricating departments. It has an electric power load of approximately 8000 kilowatts, of which 5000 kilowatts are generated by steam-turbo and hydroelectric generators, and the remaining 3000 kilowatts are purchased from a public utilities company.

To supply the necessary services for the operation of machinery, space heating, and lighting of buildings, the following utilities are needed:

► Steam generating equipment to produce 200,000 pounds of steam per hour.

► Filtration plant to produce 8-million gallons of pure water per day.

In connection with the plant, a company-owned village of 600 dwellings is provided. Also a commissary, hotel, and recreational facilities.

The maintenance department is responsible for the operation, inspection, and maintenance of all equipment not used directly for product manufacturing. This includes equipment used for supplying steam, water, air, electric power, etc.

Buildings • First duty of the maintenance department is to provide buildings to house manufacturing processes and service equipment.

Maintenance of these buildings requires constant upkeep of roofs, flashings, gutters, and walls from the outside, and protection against deterioration and abuse from the inside. This duty is assigned to the building overseer, who makes periodic inspections and needed repairs. In addition to buildings maintenance, he has charge of any new building projects not too large to be handled by the plant crew.

Fire Protection • Maintenance of fire protection equipment is the responsibility of the general mechanical overseer, who has one man permanently assigned to inspect all sprinkler systems, valves, fire pumps, elevated tanks, portable extinguishers, and fire doors. This inspector also reports any poor housekeeping that might produce a fire hazard.

A company fire brigade is composed of employees of the maintenance department. Sirens are located at strategic points in the maintenance shop. They are controlled by the power plant switchboard operator, who receives fire calls over a company-owned telephone system. Automobile truck pumpers with complete fire-fighting equipment are housed adjacent to the maintenance shops.

Power • Operation and maintenance of the steam boiler plant, steam-turbo generators, and hydroelectric plant are under the direct supervision of the power plant overseer. A regular crew of switchboard operators, firemen, and coal and ash handlers is assigned to the power plants. Maintenance and emergency work are handled by the floating electrical and mechanical crews.

Finishing Department • Maintenance of the finishing department requires closer supervision. A mechanical overseer with a crew of mechanics, pipe-fitters, and welders is therefore assigned directly to it. All machine shop work for this department is done in the central machine shop.

Machine Shop • The machine shop is approximately in the center of the group of plant buildings. It is headquarters for all employees not permanently assigned to a manufacturing department.

Operation of the machine shop is under the supervision of a shop foreman. The shop is equipped to do practically any type of maintenance job. Also a considerable amount of special and experimental machinery is built here. All types of welding as well as metallizing equipment are located in the machine shop. A crew of sheetmetal workers, with sheetmetal working equipment, is located there also.

Electrical Maintenance · All electrical maintenance, repair, and construction work is under the supervision of the chief electrician. A leader on each of the three shifts has charge of trouble shooting. An electrical construction foreman has charge of all new electrical work.

The electrical department is located in a room adjoining the machine shop, and is fully equipped with work benches, testing apparatus, coil winders, coil formers, taping machine, insulation cutter and former, dipping tank, and electric baking oven. Practically all motor rewinding is done by the electrical maintenance department; only a few special motors are sent out for repair.

Instruments · An instrument maintenance man with one helper is responsible for the operation and upkeep of all recording and controlling instruments other than those used directly in connection with the operation of electrical equipment. This instrument man has been trained in the service schools of several of the large instrument manufacturers. An instrument workshop, with all necessary equipment, is provided in a room that is separate from the main machine shop.

Lubrication · All electrical equipment is lubricated by oilers working out of the electrical maintenance shop.

In my opinion, the lubrication of all manufacturing machinery can best be handled by a lubrication specialist working out of the maintenance department with a sufficient number of men assigned to the various manufacturing departments, and with plenty of power lubricating equipment. It is the lubrication overseer's duty to work with the various lubrication manufacturing companies to determine the best methods and materials for each of the different types of machinery.

A well-organized lubrication setup is the most important part of a maintenance program.

Carpenter Shop · A woodworking and carpentry shop, with adjoining lumber storage sheds, is an essential part of the maintenance setup. A crew of painters also work out of this shop. Part of the carpenter and painter force is assigned to work inside the plant yard; the others outside the plant and in the village. They handle all types of repair and new work, from making small cabinets to heavy building construction.

Trucks and Tractors · Maintenance of some 75 automobile trucks, fork lift trucks, industrial tractors, and company automobiles is handled by a central garage crew under the supervision of a foreman. This crew is backed up by the central machine shop for any extraordnary repair work. The garage is housed in a fire-protected building outside of the manufacturing yard, and has enough floor space to house all equipment not in use. Routine inspection and repairs are made by night shifts.

To sum up: Twenty-five years of maintenance work and supervision have taught me that constant vigil and preventive maintenance are absolutely necessary requirements for the operation of any successful maintenance program.

"Enthusiastic men to run the show"

says D. E. PIERCE · Chief Engineer, General Aniline & Film Corporation, New York

D. E. PIERCE

YOU HAVE BEEN SELECTED as plant engineer for a new chemical plant and want advice. Let's assume you have a reasonably free hand. You want to be able to keep production departments happy. You don't want to ruin the controller's digestion You want your department "neat but not gaudy."

Let's assume further that you are in charge of engineering design, construction, and power as well as of maintenance. These functions are all so interdependent that they belong together. It is a mistake to include maintenance under production. Let's not do that in our ideal organization.

Before you spend much time on your maintenance setup, bear down on the design staff to see that production equipment is planned to minimize corrosion problems. Also, see that equipment is arranged for reasonable accessibility. These two points can make a world of difference in expense and in time lost through shutdowns.

Careful selection of construction materials is to be expected from a competent design staff. That staff should include one or more engineers with practical field experience in handling the same chemicals you expect to make and use. They will know where lead, rubber, enameled steel, cast iron, or stainless steel of one type or another has shown up best under the strain of actual production.

These same engineers will help your designers specify pumps, valves, fittings, gaskets, belts, and many other items which their experience has shown to be better for your conditions than others that might seem cheaper in first cost. Your maintenance men are going to have to live with these things, so get their ideas before the installation is made.

A similar point of view will help when your production equipment is being laid out. Give careful attention to arranging apparatus for efficient operation, but remember also that maintenance and repairs are done by men not monkeys. Shafts do have to be removed, kettle covers lifted, and pumps disassembled, much as we may wish they didn't. Therefore, consider where the rigger can hang his chain block or the pipefitter use his wrench.

Assuming that you have taken future maintenance

into consideration in the design and installation of your equipment, I suggest that the first essential of satisfactory and economical maintenance is your staff of engineers and foremen. You may have the best of shops and the most elaborate system of accounting and still have expensive repair unless the men who are "running the show" are both competent and enthusiastic.

Chief Field Engineer • Your man in direct charge of maintenance will have charge of minor construction also. Let's call him chief field engineer.

Pick a man with wide experience in the installation and maintenance of chemical plant equipment. Pick one who understands the fundamentals of engineering, whether his degree has been in mechanical, chemical, or some other branch of engineering. He must be alert, quick-thinking, energetic, willing to delegate authority but strong on follow-up. He must be one who can gain men's loyalty because he is fair, and their respect because he knows good work from mediocre.

Field Engineers • Under the chief field engineer, line authority will go to field engineers, each responsible for one area of the plant. These men receive all repair orders issued by production supervisors. They check the nature of jobs to see which ones need to be referred to the chief field engineer and which can be handed on to the shops or to the field crews. They discuss questionable jobs with the production departments.

These engineers must know their areas thoroughly—every piece of equipment, every pipeline, every operation. They have to keep production supervisors satisfied by preventive maintenance as well as by good planning and prompt execution of repairs. They must take an active interest in the estimating of repair jobs and in their actual cost.

They need to have inquiring minds that ask:

"Why did this unit fail? Should we have a different type of apparatus, or can we work with the operating supervisor to change these conditions to get longer life?"

They need to be inventive, able to improvise when the exact tool or piece of equipment is not at hand. They are key men in the organization.

Area Master Mechanics • The "executive officer" for each field engineer is an area master mechanic or general foreman. Pick him from successful foremen who have shown initiative, good judgment, and leadership. He has as many crew foremen under him as are needed in that area. And he coordinates the work of all crafts so that electricians, riggers, pipefitters, and machinists can do their jobs with minimum lost time waiting for the others.

His job is to see that all mechanical work is done as well and as economically as possible. His thorough knowledge of the various crafts under his supervision enables him to assist the field engineer in estimating proposed jobs and in checking reasons for costs that seem abnormal. His own original trade is of less importance than his over-all grasp of all the trades. Each of his foremen has not more than a dozen to fifteen men under him so that he can really control the mechanical work.

Staff Assistant • You will also want to provide the chief field engineer with staff assistants. Their number varies with the size of your organization. However, the functions you should provide for include a continuing study of corrosion-resistant materials; inspection of equipment in a program of preventive maintenance; instrumentation, both installation and maintenance; and a statistical study of performance records covering maintenance and other costs under your responsibility.

Maintenance Shops • If your plant is spread out like most chemical plants, you need several small shops located to serve their own areas. This avoids long trips to and from the central shop for moderate-sized jobs. Many jobs of cutting and bending pipe, of welding, and of sheetmetal work can be done in small field shops at substantial savings in transportation time.

In these same field shops, you will want to have small storerooms to carry commonly used sizes of fittings, gaskets, and valves. Be sure, however, to check the usage of these items. Avoid either building up excessive inventories or using up the stock without its being charged to proper accounts.

The organization for handling maintenance and minor construction in your plant needs various shops —machine, pipe, carpenter, paint, rigger, welding, and instrument. I urge that you provide good, modern tools in well-lighted, well-ventilated, and properly heated buildings. Labor costs too much to waste it by providing insufficient or inadequate facilities.

Storage • Your storeroom needs careful planning by someone experienced in this type of work. He will use modern storage units that make it possible for the storekeeper to find what an order calls for without delay. The system for recording sales and for maintaining inventory within maximum and minimum limits needs to be set up in the very beginning.

Have you thought of having an apparatus storage? We find it worth while to keep enough replacements on hand for important major pieces of equipment so that failure of an enameled kettle, a rotary drier shell, or a special motor drive will not shut down production while a new unit is on order. Equipment that has been taken out of service but may be used again in the future is put in good condition and placed in apparatus storage. The cost of reconditioning it is included in the value assigned to it on the apparatus storage records.

Paperwork • I hope you will keep it simple. At the same time, make sure that the cost of each job is properly charged, preferably to the apparatus number as well as to the department involved. Study the distinction between items that should be capitalized and those that are properly chargeable to maintenance—and then follow a consistent policy.

Your Yardstick • Finally, keep indexes of maintenance costs (both materials and man-hours) so that you can tell from month to month and from year to year whether you are progressing or falling behind. The common denominator for these indexes may be total pounds of production or some other easily measured item. I prefer kilowatt-hours of electric power consumed in the plant as a base. If you use that, your maintenance indexes will be "man-hours of labor per 1000 kwh" and "dollars of repair material per 100 kwh."

"If I could write my own ticket..."

says M. OLCHOFF • Plant Engineer, Solar Aircraft Company, Des Moines

M. OLCHOFF

1. I'd prepare a list of facilities under my responsibility. Then I'd delegate each item to the department best qualified to assume responsibility for maintaining it.

To illustrate: A resistance welding machine is under the electrical department. The supervisor is held responsible for satisfactory service to the machine. It's up to him to see that all cooperating departments render prompt and efficient service.

To gain this objective, I'd organize the department so that such action would be possible in the department. By listing facilities and delegating responsibilities, I'd know who is responsible for each facility.

2. I'd prepare an organization chart so that each man knows to whom he is responsible. I'd use the chart in meetings to discuss each department's responsibility and how to coordinate its activities. The chart would also help me to discuss my manpower distribution with my supervisors.

3. I'd select men for my organization who are well qualified. I'd select skilled mechanics with a high school education and trade school training. My foremen would have to have the same training, but have qualities of leadership, aggressiveness, and ability to get along with workers. My designers would have to have some college training and a background in basic sciences and mathematics. My assistant would be a younger man with a background of engineering education and practical experience. He should be able to develop the qualities which I thought were required of me when I was given my position.

In selecting an organization, I'd consider various types of men required for its successful operation.

For example: Some men do not like detailed work. I need some men who like detail. Some men can do any job, but not carry it to its conclusion; I need men who can take a project to completion. Some men are satisfied with their accomplishments; I need men who are constantly seeking a way to improve what they have accomplished.

I would also choose one or two engineering graduates to work with me on projects that would improve present facilities and operations.

4. I'd arrange my office and shop so they would be in one location. Then my organization could easily interchange orders and ideas, and understand each other's problems. If a man in the shop is working on a machine and has an idea for improving it while it is under construction, I'd want him to be able to get a quick decision on the suggested change. Much paperwork, delay, and misunderstanding is eliminated by my plan. There are many advantages and opportunities for development of the men responsible for the finished project.

5. I'd install a good work order system in an effort to control the accumulation of costs. The following method would operate in the plant:

Daily routine items. There are many routine adjustments, minor repairs, daily checks, and repetitive work to which standing work order numbers can be assigned. These jobs would be budgeted and costs analyzed monthly.

Repair orders. Every repair over a certain minimum cost or which could not be completed on the shift in which the work was started, would require that a work order and an estimate be prepared. My superior would thus know what breakdowns occurred and their estimated costs.

Preventive maintenance. Every preventive maintenance operation would have an order number so the cost of the program could be determined and a control established.

Major projects. These would require detailed estimates and study, with executive approval. All outstanding orders would be tabulated weekly for distribution to interested personnel. Any orders issued subsequently would be posted daily so that the interested personnel could determine quickly what work was in process.

My supervisors would be authorized, in case of breakdown, to get an order number right away so work could proceed. From the tabulation in the work order book, I would know at any time what repairs or work were in progress and whether an estimate had been made. The responsibility for the completion of an order would be with one supervisor, who gets help from his fellow-supervisors, as necessary.

I'd want authority from management, within limits of given individual costs or over-all costs, on some budget basis, to proceed with any project under my responsibility.

I'd want authority to do the work required on any facility, based on my judgment. In case of disagreement with others, my superior would coordinate differences of opinion. For this reason, my department must not report to production. My success is dependent upon my ability to work in harmony with others.

6. I'd set up a preventive maintenance system. I'd build it around a proper lubrication system, periodic visual inspection, periodic performance tests, and daily interpretation of the requirements of the equipment for continued performance.

I define "preventive maintenance" as the performance of certain operations on my facilities with the knowledge that, if not performed, wear or a breakdown would be accelerated beyond a point of economy. I do not consider as "preventive maintenance" the little adjustments that are made daily on equipment, or items that my men do, or have been doing, by habit and instinct, in their daily contacts with the plant. It has to be planned, periodic inspection by men trained for their tasks and with instructions in writing as to what is expected of them. The planning of the work and its coordination would have my own constant attention.

More on next page

7. I'd standardize routine operations and put them in writing. I'd see that my supervisors train the men for the work assigned to them. I'd probably discover that more than 60% of my personnel know definitely what they should do when they come to work. By constantly working on my standardized routine work, I could find other work or ways to cut down the time required to do the work. The big advantage of standardizing is that detailed work is taken away from the supervisors; they have more time to devote to the unusual and the more important problems. The advantage to the worker is that it gives him a sense of responsibility; he looks for omissions and proposes improvements.

8. I'd develop behavior qualities within my organization. These require that the men: (1) work well among themselves; (2) have a desire to analyze trouble in the plant; (3) have a desire to do work promptly; (4) work well with others in the plant; (5) have a desire to improve operating facilities, and (6) have an interest in evaluating the things that affect production and maintenance.

All this I would accomplish by meetings with supervisors and stewards, and with each supervisor individually.

To illustrate: I installed a lubrication system. The entire system was detailed and described with all the forms and listing of machines. I then called a meeting with my supervisor and the oilers. The meeting lasted an hour. I repeated it the following week. From then on, the supervisor conducted his own weekly meetings with the oilers, keeping the day crew over for half an hour so they could exchange ideas with the night crew. Through these discussions, many points of experience were exchanged, with valuable results to the company. The net result was that we got better lubrication. And the oilers were happier. The system worked because the men were sold—and because they were allowed to help improve the system.

9. I'd install a good filing system for manufacturers' literature. I would also provide a file for all possible equipment I might require for my department in the future. The literature would be available for my entire personnel, with a suitable place for them to inspect and study instructions.

10. I'd try to justify my department's being called "Plant Engineering." I'd do it by having it assume responsibilities worthy of an engineering organization. I'd try to establish the department so that all facilities I maintained would be furnished by specifications originating in my department. This could be accomplished if my organization (1) appreciated the value of experience and studies of other groups in the plant, such as standards, methods, and production; (2) was production-minded and knew production problems; (3) knew my present facilities and where they could be improved; (4) constantly improved existing facilities; (5) quickly interpreted other departments' problems.

The assuming of this responsibility would make "plant engineering" a vital force in that plant. Maintenance would not be merely a repair organization. It would contribute its experience to the new equipment and facilities acquired by the plant.

11. I'd insist that plant engineering be recognized as just as important as production. I'd insist on its reporting to top management on the same level as production.

12. After setting up my organization, my problems would start multiplying. I would want to (1) keep abreast of developments in the industry to broaden my scope of experience and outlook; (2) change any of my plans that could be improved upon; (3) secure proof by statistical data that I was getting results; (4) establish a standard by which the success of my department would be judged.

"We really did write our own ticket"

says JOHN M. WALIGORA • Chief Engineer, Sharp & Dohme, Inc., Philadelphia

JOHN M. WALIGORA

WE ARE IN the rather unique position of having already written our own ticket.

The degree of maintenance varies in different phases of our operations and is covered to a large extent by economic justification. We do better and more maintenance on a piece of equipment such as a steam boiler whose use affects most of our production operations than on equipment used in a temporary operation.

We also consider the possibility of obsolescence. We might prefer to get by with limited maintenance and replace a machine periodically. In that way we get better performance through improved design.

Here are some of the basic things we consider in order to keep our maintenance successful:

Building Design • Our engineering division includes a design group that handles all the engineering necessary for revising and improving facilities—and adding to them when necessary.

In staffing a design department, we have found it desirable to include men who have had actual maintenance experience so that they can fully appreciate problems a maintenance man must face. We are also insistent that our design people have some sales ability. The idea is that they must be able to present proper arguments for substantiating higher initial costs in a new installation when those costs are justified by lower annual maintenance costs.

An example of this occurred recently during the construction of a new chemical manufacturing plant. Our design people recommended an acid-proof tile

floor. Such a floor costs almost three times as much as a good concrete floor which, under normal circumstances, might have been satisfactory. But the facts showed that annual costs of repairing and replacing sections of floor damaged by acids would soon pay for the acid-proof tile. We were thus able to justify and get authorization for the higher expenditure.

Another example was the selection of the interior walls in some of our laboratories. Here we want the best housekeeping we can get. So we felt that the walls should be of glazed tile. Again the costs were several times what a conventional painted plaster finish would have been. But we were able to justify the expenditure through reduced annual painting and cleaning costs.

Maintenance Supervision • The maintenance department should be headed by an experienced engineer who can analyze maintenance problems and offer methods and ways of eliminating troubles leading to high maintenance costs. We place considerable dependence on this man to report to the design engineers instances where better design can help to reduce and simplify maintenance.

Inspection • We have set up periodic inspection of all buildings and equipment. In that way we detect the need for repairs before a breakdown occurs. Schedules can be set up for certain essential over-all repairs that can be made only at scheduled times without seriously interfering with production requirements.

We have combined the inspection of equipment with periodic lubrication in the hands of a skilled mechanic. This is not a job for a "grease monkey." It takes a skilled man who can detect signs of impending trouble before trouble occurs.

Paperwork • Records should be set up to give accurate pictures of the costs of maintaining equipment. We have set up a system whereby blanket orders are written annually to cover essential maintenance on individual pieces or groups of equipment.

With this arrangement, the costs of maintenance are carefully recorded. At the same time our maintenance engineer is not handicapped or held up by paperwork and lack of proper authorizations in carrying out routine maintenance.

These records are supplemented by history cards on major pieces of equipment showing what troubles have been encountered. Recurring faults are thus highlighted. And the maintenance engineer has an opportunity to take corrective action to prevent future breakdowns.

We use only one job order form for requesting repairs or new installations. A questionnaire on the reverse side requests information necessary to justify the authorization. Reduction in maintenance costs is always important to justify new installations.

We are lucky in having a member on our company budget committee who can present the cause of maintenance in getting appropriation approvals.

Planning Maintenance • A substantial portion of all maintenance can be planned in advance. We set up schedules for such items as painting, in which the maximum period is governed by the requirements for preserving the building from deterioration. Our painting schedules vary from one to five years for various parts of our plant, a shorter interval being used where severe conditions are encountered and appearance is more important.

Essential equipment, such as refrigerating compressors, is scheduled for annual overhaul during winter months when loads are low. In the same way, the boilers are shut down during summer months when the heating load is off. Ability to plan maintenance makes it possible to schedule manpower for the most efficient utilization.

Shop Facilities • Maintenance mechanics are a highly skilled class of workers. Therefore, it is just as important for them to have the equipment necessary to do their jobs quickly and at lowest possible costs as it is for production workers to have the right machines and tools.

Measured Work • One important element of a successful maintenance program to which industry is giving more and more attention is measurement of work. You cannot effectively control something that you cannot measure. Because of diversity of operations connected with maintenance work, it is more difficult to establish work measurement, but we believe that this is the tool that is just as useful to the maintenance engineer as it is to production operations.

We are just starting to use work measurement on some of our building maintenance operations and are finding that it gives us a yardstick for measuring the efficiency of our crews. This measurement is equally valuable in justifying changes in facilities, new installations, and other projects.

Experience Conferences • We hold periodic informal conferences with the heads of our design engineering, industrial engineering, and maintenance engineering departments, as well as our safety engineer. We review the shortcomings of installations and make sure that new projects will reflect improvements based on past experience. We call this group our engineering council.

At these conferences, our maintenance people are kept abreast of contemplated changes and additions. This gives them an opportunity to recommend or call attention to factors having a bearing on maintenance operations. As a result of these conferences we draw up many of our standard practices which the engineers follow in designing new installations.

TURN THE PAGE to read how six companies are really getting their maintenance money's worth. Here, for the taking — in sixteen idea-packed pages — are proved methods you can use "as is"—or adapt to your own operations.

HOW TO GET YOUR MAINTENANCE MONEY'S WORTH . . . begins on page 81

How Six Plants Control

1. WESTINGHOUSE ELECTRIC CORPORATION tells:

How We Finance Our Maintenance Program

By I. M. DINGER • Manager of Manufacture, Lighting Division
Westinghouse Electric Corporation, Cleveland, Ohio

FOR ABOUT FOUR YEARS, we have been using what we call a "maintenance equalization fund." With it, we can anticipate expenditures for care and replacement of plant equipment and buildings.

Like many maintenance cost control systems, ours is empirical. It's based partly on plant and equipment records, partly on judgment, partly on known costs.

Take boilers, for instance. We can normally expect that our boilers will require some maintenance over their useful life. And their useful life is, let's say, ten years. Let's assume that original cost and maintenance for ten years will amount to $10,000. So we set aside $1000 a year to cover maintenance and replacement.

Now suppose that bins for scrap will last 15 years. If they cost $2500, we set aside $170 a year for 15 years. By setting that money aside, we always have something to work with should the bins need repair before replacement is scheduled.

Now to answer one question you may have. This equalization fund covers only items of $500 and over. It does not interfere with a regular maintenance program in the plant. But we have cataloged all major pieces of equipment and facilities to predict their need for repair and replacement. In effect, we've negated the element of caprice in maintenance.

Keeping track of all these items and their accrual accounts is not as hard as it may seem. One thing is essential, however. Your plant engineer must keep adequate records on equipment and facilities. Without those records any system will fall apart.

We publish an equalization program data file each year. It's run off on a duplicator and given to those people who need the information.

An excerpt from a data sheet for buildings is shown at right. In the left column are account numbers. They identify the accrual account for the accounting department and for the engineering staff. Some accounts are quite comprehensive. For example, Account No. 31 is for repair and renewal of all window ledges and window sash in H-building.

A look at a data sheet for equipment reveals the same tendency to group similar items in a single account. In this case, Account 52 covers accruals for seven pumps.

We must go a step beyond the data file. It only tells us what the rate of accrual is for major items of plant and equipment repairs and replacement. Something must still be done to project the file into a maintenance program with vitality.

The first step is to prepare from data file a recommendation and request for an appropriation in the form of a budget proposal for the calendar year. This annual budget proposal is prepared by the plant engineer. When it has passed the top operating men, it goes on to the Board of Directors for action.

Items appear on the annual budget as shown in the exhibt on page 105. Notice that Item 2 calls for repair to sewers and drains at A-building, at the lower end of West 58th Street. Reference is made to Item 38 in the maintenance equalization program.

Looking back, you'll see that Item 38 covers maintenance of manholes, sewers, and drains, on a 20-year accrual basis. The annual amount available is $500. However, not all, or even a part, of that money is necessarily spent each year.

The decision to spend the money is made by our plant engineer. His efficient inspection and records system tells him whether repair or replacement is needed. His judgment must tell him if this is the proper time to do the work. If it is, then such repair is provided for on the annual budget.

Like any other system, this won't run merrily along under its own steam. There are a few requisites:

1. Records must be established by the plant engineer and they must be followed. This system calls for well-maintained files.

2. You must revise cost estimates for your accruals as actual or estimated costs change.

3. Performance of the system hinges on the ability of your plant engineer. He must know his plant and be given the authority and tools to do the job right.

Their Maintenance Costs

MAINTENANCE EQUALIZATION PROGRAM DATA SHEET — BUILDINGS

Account No.	Description	Original Cost	Useful Life	Annual Accrual
26	Maintenance of roof — I-Building	$2,500.	20 yrs.	$125.
27	Maintenance of roof — H-Building	3,000.	20	150.
28	Maintenance of garage roofs	800.	20	40.
29	Maintenance of roof, Salvage Building	1,500.	20	75.
30	Repair and renew exterior concrete work — H-Building	20,000.	10	2,000.
31	Repair and renew window ledges and window sash in H-Building	15,000.	30	500.
32	Maintenance of skylights and sash over bays F and G	8,000.	10	800.
33	Maintenance of sash in foundry	10,000.	15	670.
34	Maintenance of sash in power house	5,000.	30	170.
35	Maintenance of sash in I-Building	8,000.	20	400.
36	Maintenance of driveways and yard paving	8,000.	20	400.
37	Maintenance of railroad track	6,000.	20	300.
38	Maintenance of manholes, drains and sewers	10,000.	20	500.
39	Rebuild scrap bins at scale house	2,500.	15	170.
40	Rebuild sand bins — foundry	24,000.	20	1,200.

MAINTENANCE EQUALIZATION PROGRAM DATA SHEET — EQUIPMENT

Account No.	Description	Original Cost	Useful Life	Annual Accrual
47	Maintenance of boilers	$10,000.	10 yrs.	$1,000.
48	Maintenance of stoker equipment	2,000.	10	200.
49	Maintenance of coal and ash handling equipment	3,500.	10	350.
50	Maintenance of air compressors — Tool No's — C-2503, C-298, C-1322, C-2582	4,000.	10	400.
51	Maintenance of rotary converters, Tool No's — C-306	2,500.	10	250.
52	Maintenance of pumps — Tool No's — C-1606, C-1756, C-2625, C-2626, C-2651, C-2605, C-2319	1,500.	10	150.
53	Maintenance of feed water equipment	1,000.	10	100.
54	Maintenance of high-voltage circuit breakers	600.	1	600.
55	Maintenance of return water vacuum pumps	500.	1	500.
56	Maintenance of heating system, univents, valves, traps and radiators	1,500.	1	1,500.
57	Renew control batteries in power house	600.	7	85.
58	Maintenance of fire fighting equipment	2,500.	10	250.

SAMPLE ITEMS FROM ANNUAL MAINTENANCE EQUALIZATION BUDGET

Item Type	Description	Reason	Amount
1. General	Paint 100,000-gal. water tank, Item 20, Maint. Equal. Program	Regular maint. recurring every 3 years	$500
2. General	Repair sewer and drain at A-building at lower end, W. 58th St. Item 38, Maint. Equal. Program	To give better drainage and to prevent flooding of area during heavy rains	$975
10. General	Repair #3 Boiler Item 47, Maint. Equal. Program	Annual Repair	$1250

More on next page

COMPARATIVE EXPENSE REPORT — **NOVEMBER, 1950**

ACCOUNT OR DEPT. NAME	REF. L-LABOR M-MATERIAL	ACCT. NO.	THIS MONTH	LAST MONTH
MAINTENANCE				
TEST AND INSPECT	L	202	XX XX	XX XX
BELTMEN AND OILERS	L	206	XXX XX	XXX XX
HANDLING AND TRUCK	L	208	XXX XX	XXX XX
SWEEPERS & CLEANERS	L	212	XXXX XX	XXX XX
OTHER SHOP CLERKS	L	219	XXX XX	XXX XX
O T BONUS	L	381	XX XX	XX XX
OILS GREASE & WASTE	M	305	X XX	X XX
GEN SUPPLIES	M	311	XX XX	XX XX
PRINT STAT & OFF SUPPLIES	M	316	X XX	X XX
DIR MFG SUPPLIES	M	318	XXX XX	XXX XX
TELEPHONE	M	320	X XX	X XX
SMALL TOOLS	M	396	XX XX	XX XX
BUILDING REPAIRS	M	402	XX	XX
MACHINERY REPAIR	L	403	X XX	X XX
FURNITURE & FIXTURES REPAIR	L	406	X XX	XX
IDLE TIME	L	304	XXX XX	XXX XX
TOTAL EXPENSE			XXXX XX	XXXX XX

PROPOSED EXPENDITURE BY YEARS

PROJECT
Restoration of Buildings #1, 2 & 3 Items (#1 - 28 - 29 - 30 - 31)
Plating Room Items (#2 - 8 - 9 - 10)
Factory Roofs Items (#3 - 4)
Painting Items (#7 - 50 - 57 - 58)
Sidewalks Items (#5)
Lighting Items (#12 - 13)
Heating Items (#43)
Replacing Piping Items (#21)
Flooring Items (#33 - 34 - 35 - 48 - 52 - 53 - 54)
Department Rearrangement Items (#25 - 26 - 27 - 32 - 45 - 46 - 47)
Power Plant Items (#15 - 16 - 17 - 19 - 49)
Electrical Wiring Replacements Items (#6)
Stairways Items (#38)
Ceilings Items (#39 - 40)
Factory Cleaning Item (#14)
Miscellaneous Items (#18-23-24-37-44 - 51 - 55 - 56)
TOTAL

*Remainder to be spent in 1954 and 1955.

CONTROLLING MAINTENANCE COSTS . . . begins on page 104

2. MANNING, MAXWELL & MOORE, INC., says:

Two Budgets, Two Forms Control Our Maintenance Costs

By HENRY M. BRADLEY • Plant Engineer
Manning, Maxwell & Moore, Inc., Bridgeport, Conn.

THE PLANT ENGINEER at Manning, Maxwell, & Moore works closely with top management in deciding how much money to spend for maintenance and plant improvements. In fact, I don't know of any company that has such close control of these expenditures, yet makes this control as easy to execute.

We have worked for over 20 years on a budget basis. It's in our blood. We plan every dollar we spend. And we know if a job cost goes haywire, and why.

Every division and department head—operating and indirect—is responsible for *all* costs in his area. Direct and indirect. All our six plants are organized alike. The division heads at Bridgeport, for example —production, inspection, chief engineer, plant engineer, accounting, purchasing—all head up to a local works manager. He in turn reports to the general manager, who reports to our president.

In theory and practice our plant engineering de-

BUILDING AND SERVICES

TOTAL COST	1951	1952	1953
$18,175.00	$18,175.00		
5,919.75	5,919.75		
5,000.00		$3,000.00 (3)	$2,000.00 (4)
6,021.56	3,450.00 (7-57-58)	1,618.00 (58)	953.56 (58)
1,200.00	1,200.00 (5)		
2,400.00	2,400.00 (12-13)		
2,000.00			2,000.00(43)
2,500.00	1,250.00 (21)	1,250.00 (21)	
4,222.00	3,222.00 (34-48-52-53)	700.00 (33-54)	300.00 (35)
15,565.95	9,136.10 (25)	1,372.85 (26-27-45-46)	4,997.00 (32-47)
1,320.00	1,012.00 (16-48)	130.00 (17-19)	178.00 (15)
1,000.00	500.00 (6)	500.00 (6)	
1,110.00	50.00 (30)*		
165.00	165.00 (39-48)		
3,010.00	602.00 (14)	602.00 (14)	602.00 (14)*
3,283.10	650.10 (18-23-24-37-51-55)	820.00 (18-37-56)	728.00 (44)*
$72,752.36	$47,731.95	$9,992.85	$11,758.56

SCHEDULE OF ITEMS

ITEM #1 Bldg. #1

Correct all floors, repair concrete, and waterproof building. Firm quotation from outside source for $8,950.

ITEM #2 Bldg. #5, 2nd floor, Plating Room

New acid resisting floor. This estimate of $2,704 is based on removing all equipment from floor for a period of two (2) weeks, rip up present floor, and relay a tile acid resisting floor. Outside contractor's cost is based on $2.00 per sq. ft. times 1302 sq. ft. equals $2,704.

ITEM #3

partment is a *service* organization. We are responsible to top management for keeping the buildings, general equipment, and facilities in whatever condition it dictates for efficient and profitable operation. The cost of general plant maintenance is my worry.

But I am also at the beck and call of all other departments to maintain and repair their working equipment. Or they may ask me to install new equipment, or improve or rearrange existing equipment. Our relationship is precisely like that of an outside contractor.

We have to estimate labor and material costs so that a department head can get management to OK a project. These costs are his responsibility. Even if money is spent by my department, it's charged to him. He also pays his share of light, heat, air, steam, light bulbs, belting, and other supplies. So you can bet he watches my performance on that, too.

In any case, the plant engineer acts as a staff adviser, on both engineering problems and installation and operation costs. This means that practically every expense project involves the plant engineering department. We have to plan, work out details, and carry out all work orders approved by management.

These cost distinctions of who is responsible for what expense are important to our control of costs by our budget system. Obviously, no two departments face the same operating problems. But the system in principle is the same for all departments. It divides expenditures into two main parts: (1) running expenses, and (2) special projects.

In budgeting running expenses, management says in effect: "Here's what you can spend to operate each month." Then later: "Here's what you have spent. Please explain any variances."

As to special projects, management says: "We know you will need money for unexpected repairs or changes. We also invite your recommendations for improvements. But to stay in business we've got to spend wisely. You have to justify each outlay."

Here's how both edicts are carried out. First, top management gives every department head a "budget book" to help him control his running expenses. Then it asks him to list separately all large repairs or capital expenditures that he needs or wants to make in the near future. The capital expenditures may replace or add to present equipment, or involve new equipment.

To simplify its review of these proposed expenditures management also makes available two appropriation request forms. One form helps the department head justify a large repair expense—the other, a capital investment.

The same rules for controlling running or large expenditures apply to all departments. Since we are interested particularly in the plant engineering department, let's see how expense control is put to work there.

BUDGET BOOK CONTROLS RUNNING EXPENSES . . . First we'll consider the budget book as drawn for the plant engineering department. Remember, our budget book covers all normal running expenses for serving all other departments. If our service fails, our department gets nicked for the downtime. It's shown as "idle time" on the report. In practice, this budget may include small tools up to $25 per job or repairs up to $250 per job, all to remain within the total budget limit.

HOW WE ESTIMATE RUNNING EXPENSES . . . Each year the works accountant and works manager ask me, "How much money do you think you need to serve everybody so we don't have any downtime

TWO BUDGETS, TWO FORMS . . . begins on page 106

REPAIR APPROPRIATION REQUEST

Date November 17, 1950

☒ ORIGINAL	☒ BUILDINGS	☒ REPAIR	☐ ADDITIONAL
☐ EQUIPMENT	☐ FIXTURES	☐	☐

An appropriation is requested for:
$350.00 for necessary repairs to storm sewer line running from Bldg. #1 to Bldg. #3 - requires 4" tile line.

Installation cost: (Breakdown attached)
Firm price of $350.00 from outside contractor

Estimated savings per year:
No savings - expense appropriation request

Remarks:
This is an emergency - sewer backing up - work must be done over week end.
(Funds taken from item 21 of Expenditure By Years)

R. E. Mason
WORKS MANAGER

Henry M. Bradley
PLANT ENGINEER

from improper services, or maintenance? How much in each account?"

Our budget book is set up by 16 labor and material accounts which we have learned by experience cover all our needs. You can see what they are in the comparative expense report on page 106. We base our expense forecast for each of these accounts on several things. Some expenses run fairly constant from month to month, such as telephone, sweepers, and cleaners. Then there's routine work—its cost is based on past performance in the light of current costs. And we can tell from a production forecast what we need to figure on extra and overtime shifts.

We also do some soul-searching on the adequacy or superfluity of our services. Ought we not to improve our preventive maintenance on switchgear? Do we need to lubricate motors so frequently? Let's buy better brooms—the ones we are using don't do the job. How about saving some labor in the long run by equipping our fluorescents with better starters? And so on.

As the years have gone by we have refined and improved our analyses and estimates. Finally we add up our projections and submit them to management for approval.

Management may not see fit to accept every item. We have to convince management of its necessity, or lose out. And we have to remember that in keeping expenses down management is keeping profits up, and our jobs more secure. In the end, management comes up with a flat monthly budget figure within which we must operate or explain why we failed.

HOW WE CONTROL RUNNING EXPENSES . . . After the close of each month we get a "Comparative Expense Report" which tells us our actual running expenses for that month (see page 106). These data were tabulated by the accounting department from account charges on labor time cards, stock requisitions, purchase orders, and vendor's bills for materials or services. We accumulate these reports in a hard-cover binder. You'll always find it within reach on the desk—it's used that often.

By being able to see how expenses are running, we are able to guide them intelligently in the future. When my men come to me with requests of "I want this or that tool," I always check with the budget book to see where I stand. After a look, many times I have to say "Wait until next month."

Budget reports help management understand my problems better, too. Sometimes the works manager sends me a note reading like this: "Your labor for sweepers and cleaners is umpty-ump dollars more than usual. What happened?"

It's nice when I can reply: "The flood on Saturday, November 25, made it necessary to call in men on Sunday to mop up the plant. We got the plant in shape for the Monday morning whistle blow." The point is, you don't usually find yourself without a good answer—for you don't spend more than the budget allows unless there's an unusually good reason to back it up.

HOW WE CHANGE OUR BUDGET LIMITS . . . Even during the budget year a change in limits may be necessary. When it's downward, our works manager takes the initiative. He tells us why he has to demand a cut in expenses, and how much we have to trim the total.

So I sit down with all my supervisors and scrutinize the makeup of every item. Maybe we can eliminate a fringe service here, or cut down on tools there. It's so easy to trim indirect labor, but it's not

always wise. Where to trim is my responsibility, so long as I meet the cut.

Maybe a rising work-load needs more craftsmen, or too many electrical breakdowns justify another electrician. It's likewise my responsibility to inform management of this state of affairs, and to prove it with facts and figures that no reasonable management will fail to see.

APPROPRIATION REQUESTS CONTROL LARGE OUTLAYS . . . It takes an appropriation request to get top management approval of any outlay over $250 for a repair or $25 for a capital item. The company's method, however, for inviting recommendations for expenditures encourages a lot of ideas and sifts out the good ones for action. Watch how it works.

WE BEGIN WITH A FORECAST . . . Every September the works manager circulates a request to all division heads to submit capital budget projects for the coming year. Purpose is to appraise as nearly as possible the anticipated cash outlay. It also gives the division head a chance to survey his departments for future improvements.

The plant engineer answers this request by two similar lists, which I call "Proposed Expenditures by Years." One list covers "Buildings and Services"; the other, "Machinery and Equipment." These lists show the extra expenses over and above the routine running expenses of the maintenance budget book. They represent what money I need to keep the plant in A-1 shape.

You can see a portion of a typical buildings-and-services list on pages 106 and 107. Note how we try to forecast and prorate the big jobs over a period of years. Some items are for major repairs. Others are replacements or improvements. The accounting department decides which is which.

WE ATTACH EXPLANATORY SCHEDULES . . . To each of the two forecasts I attach a schedule of items showing the breakdown. Exhibits on page 107 of items 1 and 2 are typical. Wherever possible each item briefly describes the work to be done, the reason, and the cost of labor, material, and overhead charges. The item numbers are grouped on each list for each project.

Preparation of these lists is a careful and studied job that goes on all year around. I am constantly accumulating ideas on future needs, and filing memorandums on "Items Needing Repair" that can wait for the budget request.

I call in my supervisors for a survey of needs in their sphere—electrical, mechanical, carpentry, pipefitting, and so on. Also, I ask them what can be improved.

I tour the plant, check my lists with production supervisors to make sure there are no omissions. I review past history, as for painting, and I can schedule repairs, as for new roofs. I resurrect a special file of items that management has previously rejected but which I feel are still justified.

WE JUSTIFY OUR RECOMMENDATIONS . . . Management does not act immediately on the plant engineer's lists of recommendations. These projects don't all come up at once. As each need arises, I present to management a formal proof of need or justification for action. We use two forms to show what's needed, one for repairs, the other for improvements.

The form used for repairs is shown on page 108. It needs little explanation. It's used on those subjects that require immediate attention or cannot be tied down to specific savings. Justification for their approval lies mainly in continuation of operations at an efficient level.

Where we think improvements will result in worthwhile savings, we use a 3-page investment analysis form (not shown). This form develops by questions a series of facts designed to bring out all the economic and operating factors that will help management decide: Is it wise or necessary to make this investment?

The form asks questions such as these:

Is proposed equipment a replacement? Does it add to capacity? Is it a new facility?

Will the purchase relieve a bottleneck in scheduling? Reduce our inventory? Enable us to ship more promptly? Create other advantages?

How long can the proposed equipment be economically used?

Then the form develops cost data on salvage value of existing equipment, and various savings expected per year in (1) direct labor, (2) indirect labor, (3) supervision, (4) reduction in rejects of scrap, (5) materials costs, (6) tooling, (7) maintenance, and (8) intangible benefits such as floor space, safety, and housekeeping.

These savings are calculated three ways, on the basis of normal, slack, and busy operations. The normal savings are totaled to show a dollar figure for total estimated annual saving.

This total saving is then measured against the annuity which at compound interest will equal the cost of installation in the expected life of the new equipment. Rate of interest is guided by present investments. We use this investment analysis for all purposes—machine tools, service equipment, plant services, or even buildings. There are other good methods and formulas for computing return on investment, such as recommended by MAPI or the ASME. (See "How to Figure When to Replace Plant Equipment," FACTORY, November, 1950.) What I want to emphasize is that by using a recognized formula we are able to present to management in black and white the justification for our ideas.

IT'S NOW MANAGEMENT'S TURN TO ACT . . . Management now has all the facts and figures it needs to decide what to do. We are satisfied each case gets a fair hearing. But we've had to learn, too, that we can't always have our own way. Management such as ours usually has better reasons than ours when it says "No."

But with a fact-finding report such as our repair form or investment analysis before it, management is making it easier for us to show how and where it can save money. These same forms are used throughout the year to "prove in" projects not anticipated in the annual forecasts.

In our plant this business of expense budgeting is a two-way street between top management and department heads. Management says "yes" or "no" only after it has listened to our request for funds. In turn we make pretty sure, therefore, of having a good case before we present it. The net result is that no time is wasted on duds. This leaves more time to consider and accept good ideas. *More on next page*

CONTROLLING MAINTENANCE COSTS . . . begins on page 104

Budget Comparison Report to Maintenance Dept.	For 6-23-50	Budget Period to Date
Department payroll	$3,619	—
Less Non-Budget work (Capital expenditures)	867	—
Actual Expenditure	2,752	130,650
Budgeted Amount	3,084	131,772
Variance (~~over~~, under)	332	1,122
Days to go in budget period	65	

DAILY REPORT keeps Kellogg's management posted on labor cost of plant maintenance. It goes to the plant manager, chief engineer, and plant engineer. The comparison of actual cost against budget allowance shows how well or poorly you are doing. Then you can speed up or apply the brakes on maintenance projects.

3. KELLOGG COMPANY tells:

How We Budget Maintenance for Dull and Busy Seasons

By RICHARD C. WEEKS
Plant Engineer, Kellogg Company
Battle Creek

THE SIMPLE LITTLE CARD you see above gives a day-to-day picture of how well the Kellogg Company is performing against its maintenance budget.

Budget report cards like this one are placed on the desks of the plant manager, chief engineer, and plant engineer daily. They show how actual maintenance costs compare with budgeted costs—up through the preceding day.

The cards are, in effect, the pulse of maintenance performance. They give the right people a quick summary of performance in time to correct any important variances that might develop.

Our maintenance department has operated under a budget system for many years. This budget provides for the allocation of funds for time and material expended by approximately 200 maintenance mechanics. The present budgeting arrangement is the result of long experience and revision. We know the present budget structure is satisfactory, but of course we are always striving for improvement.

Experience at Kellogg has indicated, for example, that for most efficient plant operation we must maintain a standard ratio of maintenance man-hours to pounds of food produced. This ratio is used as a basis for preparing our preliminary maintenance budget figures and as a check in final budget comparisons.

We prepare our budgets for a four-month operating period, with the periods starting in January, May, and September. This period best fits our production cycle. Approximately 6 weeks before the end of a budget period the sales department sends out a sales forecast for the next period. Based on this forecast, the number of production days and equipment required are tentatively scheduled. Armed with this information plus the requests of departmental supervisors for major repair work, we tackle the preparation of the maintenance budget.

The plant is composed of 55 operating and service departments, each of which receives an allocation of funds over a set period from the maintenance depart-

ment budget. Expenditure of these funds is initiated (1) by a departmental supervisor's request for work or (2) by assignment by a maintenance foreman to a repair job that may be reported by a maintenance inspector or a departmental foreman. In either case written work requests are sent to the plant engineer's office on a special form which carries a serial number.

Two Kinds of Work

We divide the maintenance budget into two categories: (1) contract maintenance and (2) maintenance department. Contract maintenance is that part of the work requiring special skills or equipment for work that is beyond the capacity of the regular maintenance crews, and therefore has to be done by contractors. Black topping, roofing, and large floor repair jobs are representative items.

The second category, maintenance department, is subdivided into four groups (1) large jobs, (2) jobs by assigned mechanics, (3) budget period jobs, and (4) miscellaneous small jobs and ticklers.

Large jobs (group 1) are specific repairs or changes which are estimated to cost in excess of $500. The work by assigned mechanics (group 2) covers approximately 100 millwrights, steamfitters, electricians, oilers, sheetmetal men, mill repair men, and packing room repair mechanics required to handle routine maintenance work.

We schedule this type of work on three 8-hour shifts; most of it is done on the day shift. Partial crews handle week-end operations.

All routine maintenance work is done on a direct department charge. Work requests for service are either phoned by foremen of operating departments or brought in by maintenance inspectors to the maintenance department dispatch office. The requests are entered on the worksheet, also the time of the report, location and description of work, originator of the request, the departmental account number and the craft involved. The craftsman's name and time he is dispatched are entered later when the maintenance foreman makes his assignment. A time card is made out upon completion of the work.

Budget period jobs are those recurrent jobs not handled by assigned mechanics. They include items such as mill knife grinding, scale repairs, and instrument repairs. These jobs are given standing numbers which carry through the entire budget period. Miscellaneous small jobs and tickler jobs are those expense items under $500, which cannot be handled by assigned mechanics because of the work load – or because special skills are needed.

Preparation of the budget estimates on large jobs begins far in advance of the remainder of the budget. Some specific large repair items are regularly scheduled for certain periods of the year due to equipment availability, and therefore are placed in the proper budget period automatically. These are jobs such as overhaul of "in line" equipment, repairs of packing room equipment, and painting. We base such estimates on job records for the same jobs in past years. Periodic repairs to ovens, cookers and the like can be fairly well anticipated and are included by specific items in each of the budget periods.

Sometimes we get a large job work request from a department supervisor that is not covered in the current budget. If it can be deferred, we estimate the cost and file it for inclusion in the next period.

Our assigned mechanics crew is stable in size throughout the year, so this portion of the budget depends upon the days or production forecast and the volume of production required. From this information we can estimate the number of men for week-end work and determine the total man-hours per man per budget period. Multiplication of this figure by total men and average hourly rate gives the dollar value for this item.

Budget period jobs are dependent directly on pounds of food produced, since, as explained above, they are recurrent work items, such as mill knife grinding. Past experience and actual job records provide the information for estimating these items on the basis of the production forecast. Adjustments are made when technological changes improve equipment or parts performance.

Past experience determines to a great extent the amount of budget for the miscellaneous small job and tickler items. During periods of high production when assigned mechanics are particularly busy with emergency work we increase this amount. Purpose is to fill the need for additional men to do many of the small jobs which in low production periods could be performed in spare time by the assigned mechanic. We also use this account to some extent to maintain the correct balance between maintenance man-hours and pounds of food produced. Material in this category is estimated on the basis of past experience.

A preliminary budget figure is derived using the pounds of foods forecast as a basis. We compare this figure against the totalization which results from the above method of preparation. Major deviations are analyzed and revisions made if advisable.

The proposed budget figure is then broken down and distributed to the various plant departments. These department figures are then checked against expenditures for the same period in the previous year and major variations again analyzed.

During the course of the above budget preparation, figures and variations are reviewed with the chief engineer, since the maintenance budget is a part of the entire engineering division budget. This in turn forms one of the major sections of the overall plant budget. Following approval by the chief engineer, the departmental figures are given to the plant manager for this approval, and released to the supervisors for inclusion in the over-all plant operating budget.

Day-to-Day Picture

When the budget has been approved, a daily expenditure figure is established. This figure varies, due to our method of scheduling maintenance crews for seven-day operation. We do not operate with a swing shift but by scheduling "off" on Monday that portion of the crew required for week-end work. Thus a figure for Monday, Saturday, and Sunday is smaller than for the remaining days of the week.

This figure is made the basis for our daily control system, mentioned in the first paragraph of this article. Mechanical department charges obtained from completed work orders are totaled on the day following expenditures. We break this figure down into budget and non-budget items. We are then able to check our daily variance from scheduled cost and take steps to correct any major trend away from normal.

A running account is also maintained on the total budget and total actual expenditure with the variance to date. This information is all contained on 2½" x 4½" cards as shown on the preceding page.

MAINTENANCE COSTS . . . begins on page 81

TOTAL LABOR EXPENSES

Operating Budget Report: Plant Operations Department

Description	Actual January	Actual February	Budget February	Variance February	Actual Year to Date	Budget Year to Date	Variance Year to Date
DIRECT LABOR	XX	XX	-0-	XX	XXX	-0-	XXX
LABOR EXPENSE:							
Supervision and Staff	XXXX	XXXX	XXXX	XXX	XXXXX	XXXXX	XXX
General Indirect Labor	XXXXX	XXXXX	XXXXX	XXXX	XXXXX	XXXXX	XXXX
Clerical and Stenographic	XXXX	XXXX	XXXX	XXX	XXXX	XXXX	XXX
Messengers and PBX Operators	XXXX	XXXX	XXXX	XX	XXXX	XXXX	XXX
*Premium Wages—Overtime	XXX	XXX		XXX	XXXX		XXXX
*Premium Wages—Double Time	XX	XXX		XXX	XXX		XXX
Premium Wages—2nd & 3rd Shifts	XXXX	XXXX	XXXX	XX	XXXX	XXXX	XX
Premium Wages—Holiday	XXXX	XXXX	XXXX	XXX	XXXX	XXXX	XXX
Operating Supplies	XXXX	XXXX	XXXX	XXX	XXXX	XXXX	XXXX
Maintenance of Automotive Equip.	XXX	XXX	XXX	XX	XXXX	XXXX	XXX
Rearrangements and Alterations	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
General Maintenance Labor	XXXX	XXXX	XXXX	XXX	XXXXX	XXXXX	XXXX
*Lost Time—Traveling Interplant	X	X		X	X		X
Lost Time—Union Activities	XXX	XXX	XXX	XX	XXX	XXX	XX
*Lost Time—Safety Meetings		X		X	X		X
*Lost Time—Other	X				X		X
*Retroactive Wages and Adjustments	X	X		X			
TOTAL LABOR EXPENSE	XXXXX	XXXXX	XXXXX	XXXX	XXXXXX	XXXXXX	XXXX

FAIRCHILD AVIATION CORPORATION says:

Fixed Budget Controls Maintenance Costs

By WAYNE CARROLL • Budget Control Analyst
Fairchild Aircraft Division, Hagerstown, Md.

BUDGETS ARE THE FINANCIAL BACKBONE of all operations at Fairchild. They include plant maintenance—it's one of our major operating activities.

Budgets help us control all our operating costs. We know that to make a profit we can allow only so much money for expenses. So each fall we give to every department manager a projected production schedule for the coming year, showing the number of direct production workers needed to carry it out.

Then after much deliberation each manager tells us in some detail on a prepared form what he expects to spend. We combine these estimates to make an over-all budget. If the total sum exceeds the allowable, we have to cut and trim various parts.

WHAT BUDGETS DO FOR US . . . Of course, the job isn't quite as simple as that. We work with all major departments—administration, production, industrial relations, plant operations, and so on. Each department is a business in itself. Each has its own peculiar problems. Some are interrelated. But since you're interested in how we budget plant maintenance, we'll deal only with that.

At Fairchild, plant engineering and maintenance is handled by our plant operations department under the plant operations manager. It's his job to keep the plant in tiptop shape, consistent with over-all efficiency at lowest cost.

Every maintenance job, large or small, comes within the budget. If maintenance costs begin to pile up, the department head knows from a detailed analysis what is going wrong. And he can make needed adjustments.

Here's what our budget procedures do for us:

1. Provide a measure of performance.
2. Make a guide for efficient operation.
3. Give a means of control of expenditures, because we know where every penny goes.
4. Hence, also serve to cut costs.

We don't claim that budgets alone will remove or cure operating inefficiencies. It will always be the job of the department head to improve efficiency and cut corners. But budgetary control helps him a lot to do these things. This holds just as true for maintenance as for direct operating departments.

TOTAL OTHER EXPENSES

Operating Budget Report: Plant Operations Department

Description	Actual January	Actual February	Budget February	Variance February	Actual Year to Date	Budget Year to Date	Variance Year to Date
OTHER EXPENSE:							
Stationery and Office Supplies	XXX	XXX	XXX	XX	XXX	XXX	XX
Operating Supplies	XXXX	XXXX	XXXX	XX	XXXX	XXXX	XX
Gasoline and Oil	XXX	XXX	XXX	XX	XXX	XXX	XX
Maintenance Materials—Tools	XXX	XXX	XXX	X	XXX	XXX	XX
Maintenance Materials—Auto. Equip.	XXX	XXX	XXX	X	XXX	XXX	XX
Rearrangements and Alterations—Mat.	XXX	XXX	XXX	XX	XXX	XXX	XX
General Maintenance Materials	XXXX	XXXX	XXXX	XXX	XXXXX	XXXXX	XXX
Power	XXXXX	XXXXX	XXXXX	XXX	XXXXX	XXXXX	XXX
Light	XXX	XXX	XXX	XX	XXXX	XXXX	XX
Water	XXXX	XXXX	XXXX	XX	XXXX	XXXX	XX
Gas	XXX	XXX	XXX	XX	XXX	XXX	XX
Coal and Fuel Oil	XXXX	XXXX	XXXX	XXX	XXXX	XXXX	XXX
Telephone and Telegraph	XXX	XXX	XXX	X	XXX	XXX	XX
Traveling Expense	XX	XX	XX	X	XX	XX	X
Transfer of Charges to Other Depts.	XXXX	XXXX	XXXX	XXX	XXXXX	XXXXX	XXXX
TOTAL OTHER EXPENSE	XXXXX	XXXXX	XXXXX	XXX	XXXXX	XXXXX	XXX
TOTAL EXPENSE	XXXXXX	XXXXXX	XXXXXX	XXXX	XXXXXX	XXXXXX	XXXX

HOW WE EVOLVED OUR BUDGET PROCEDURE . . . You can't establish a good budget procedure in 24 hours. We've been at it for years, and keep improving it right along.

A good budget procedure must be evolved. You have to constantly analyze operations. You have to find and test criteria for a budget base. We first tried to correlate our maintenance budget to direct man-hours, but it didn't work. I'm not saying it won't work in your case. But I do say you can't pick a ready-made procedure off the shelf.

We also tried to gear maintenace costs to the total number of employees (direct plus indirect), and on a square footage basis. These criteria gave us wide fluctuations—one year high, the next year low. We found that maintenance costs are not in direct proportion to increases or decreases in employment.

We now use a fixed budget, as contrasted with the flexible type budget in vogue in many plants. Last year our actual maintenance costs ran within 1% of the budget. That's pretty sharp, we'll admit, and we don't always hit that close. But our score has always been within plus or minus 5%. This proves we are using proper criteria and methods suited to our operations.

Here are a few of our basic concepts:

1. We don't try to tell the maintenance department how much to spend for millwrights, carpenters, plumbers, and so on. In fact, we don't even pretend to have the know-how to do this. That's a job for the plant engineer.

2. We don't budget capital expenditures in the maintenance budget. They are included in a separate budget to cover appropriations needed for capital equipment. This involves a study of installation and operating costs and expected savings. Each case stands on its own feet for management decision.

3. We don't budget overtime. Fairchild takes the view that a man should balance his operations without overtime. All overtime must have executive approval. As a result, there's not much of it.

4. We budget only those expenses over which the department manager has control. Therefore our maintenance budget does not include insurance of any kind, social security, depreciation, sales and use taxes, and the like.

HOW WE SET UP THE MAINTENANCE BUDGET . . . There are many angles to setting up a maintenance budget. Here's where I'm going to let someone do the talking who has first-hand experience with this phase of budget preparation. He's J. Earl Steinhauer, our plant operations manager. Although he and I see eye to eye on these procedures, his remarks will be colored from the view of his function as a plant engineer. This is his story:

"Every year the company asks me, through Wayne Carroll, the budget analyst, how much money I need to operate. You can bet I've got to be mighty sure of my facts and figures if I want to get them approved. And I don't want to look bad at the end of the year either. Too much surplus is almost as bad as too big a shortage. It means I don't know my business.

"My estimates have to include labor and material for maintenance of all plant facilities (buildings and grounds, heating, ventilating, lighting, etc.) and all plant services (electrical, mechanical, water, steam, and so on). I am not charged with the repair and upkeep of production equipment. Each production department shoulders its own bill for labor and material. But I do have to keep a pool of craftsmen on the payroll to do all that type of work, too. The production departments 'pay' me for that labor. The materials are charged to them. *More on next page*

"We set up the budget for a whole calendar year ahead, on a monthly basis. After some years in development we have drawn up a list of labor and material expense accounts that cover all our needs. This list guides our predictions. When we finish our budget estimate, we've come up with a budget running over $100,000 each month. No two months are alike.

"The budget for each month is broken down into 11 items for labor costs, and 15 items for material and other expenses. You can see the breakdown of 'Labor Expense' and 'Other Expense' in the sample monthly budget reports on pages 112 and 113. The items marked with an asterisk are not budgeted because they seldom exceed, say, $10 per month. But we include them on the operating report, as well as other special accounts, whenever we need to show where the money went.

"The first item, 'direct labor,' is not budgeted for the plant operations department. It, too, shows where money was spent, but this time for direct production. For example, a production department may borrow a maintenance welder for a few hours. Obviously the plant engineer is not held responsible for this item as an expense.

"Many of these 26 labor and expense items are made up of a host of smaller items. You can't afford to overlook too many of those smaller items. The misses, if too many, can add up to quite a sum. So we comb every possibility.

"On our labor expense, in general, we decide how many salaried and hourly employees we need each month *as we see it* at that time. These are converted to money. We decide, account by account, how much materials will cost.

"Many factors affect these predictions. We list all the big jobs, and what month they are due. We review the breakdowns for the past five years in the light of current needs and prices. We think first of what it will cost to maintain *present* equipment. Then we look into the future on the basis of the present and the past. Our schedules, for example, are very helpful: painting, road care, ground care, fence care, machine overhauls, and so on. We study our outside maintenance contracts—elevator, roofing, communications. The warm and cold seasons influence monthly operating costs.

"One of the best sources of budget information and data is our own group of maintenance foremen. We ask them to turn in a list of their observations of needs in (1) operations and (2) plant maintenance.

"They are becoming experts at estimating costs because they have to do this all the time on all large repair jobs and all rearrangements or alterations. We also canvas the operating foremen and department heads to get a line on what size labor pool is needed for machine maintenance. Our general foremen also are asked to turn in a list of tools and equipment for replacement.

"Here are some of the more important things we have to think about when appraising our labor costs. We begin our calculations, of course, from the production (direct labor) schedules given us. We have to decide how many craftsmen of the different trades we need—electricians, machinists, pipefitters, welders, millwrights, and construction men. Also how many janitors, laborers, utility workers, and guards.

"We have learned a lot about worker ratios by past experience. A particularly helpful chart, dating back to January, 1944, shows the total number of employees each month in each of these categories. A similar chart shows how the total of all maintenance workers varies with changes in direct and other production personnel.

"These charts prove there is no fixed ratio between production and maintenance workers. Special conditions affect the maintenance needs. For example, when Fairchild adds a second or third shift, we know we have to add custodial employees. But extra shifts don't affect the boiler house or sewage plant, and in the plant itself we have to keep stand-by mechanics anyway. The charts also show our trades are not much affected by any but radical changes in direct personnel.

"Successful budgeting calls for accurate interpretation into dollars of quantities or numbers needed. You've got to understand the labor contract thoroughly on wage rates and increases to estimate labor budget costs. Merit raises can take quite a chunk. In pricing materials we use current market figures. We don't attempt to project rising or falling prices—it can't be done. To estimate the amount of materials and supplies needed we review our inventory cards and totalize the needs on the basis of a 30-day average usage. Quantities for items such as paint are taken off the painting or similar schedules.

"These comments just hit the high spots of our procedures in setting up a maintenance budget. It looks like a big job, and it is. Each year, however we have refined it some more, so that now we feel we've got everything, and got it right. But there's a great danger, we have come to realize, of taking routine items for granted year after year.

"Let me illustrate. For some time our city sewage charge was based on the amount of water purchased. This basis presumed that all purchased water became contaminated and had to be drained into the city sewage system. The questioning mind, however, did not accept this premise. We found that only one-fourth of our purchased water actually became contaminated. By a few simple pipeline changes we were able to drain the other three-fourths into the storm sewer system. We cut our budget cost on that item in the same ratio.

"All of which teaches an important lesson: When setting up your budget every year, *re-examine every budget item for savings if you want to get plus values from your budget procedures.*"

Those are the comments of our plant operations manager.

HOW WE PROVE IN THE BUDGET . . . You have just seen what steps the plant engineer takes to draw up his budget. He presents his summary figures to me (budget control analyst) substantially in the form of the final plant operations budget. It shows month by month the estimated total expenses for all 11 labor accounts and 15 material accounts. I also get supporting data, where needed, to show the make-up of these general items.

At Fairchild the budget control analyst fills a staff function and reports directly to the manager of accounting. It's his job to appraise and screen the proposed budget in preparation for final approval by management.

The budget analysis is directed toward (1) reasonableness of the request and (2) accuracy of figures. When we deliver the budget later to management we

are certifiying it as reasonable and safe from an accounting standpoint. We work on the principle you can't tell a department manager how to run his department. But you do have to be prepared to justify any unusual looking figures.

So we go over all the figures with a fine-tooth comb. We check the labor items, for example, to make sure they are properly evaluated as to dollars for manhours in 28-, 30-, and 31-day months. We check on the effect of vacations and holidays, contract raises, etc.

Material items are checked against experience data, current market conditions, and specific developments since the last experience. On items such as power, light, water, gas, and fuel oil we have records of current experience, purchases, and current inventory. Telephone and telegraph bills are fairly constant. We make hundreds of other checks.

Sometimes we find points on which we disagree with the plant engineer as to necessity or amount. We confer with him on all such items to see if we can reconcile our differences. Both parties realize this preliminary screening is a valuable function and takes the load off top management in settling reconcilable differences.

There are times when the plant engineer objects to a suggested revision. He has this right. **Whenever he assumes it, he knows he has to defend his stand before management.** We agree to disagree.

Now comes the final budget discussion. It's attended by the plant engineer, the budget analyst, the manager of accounting, the comptroller, and if necessary, the general manager. The proposed budget has already been passed on to the comptroller for scrutiny before this meeting. He has marked the items he wants to question. He now asks "Why?" and the plant engineer explains.

If management says "You can't have that," he might reply, "Well, then you can't get such-and-such service you asked for." Then it's up to management to decide whether or not it wants that item badly enough to pay for it. In other words, it's up to management to decide how much maintenance. And it bears the final responsibility. That's the basis on which we wind up with our "established" budget.

HOW WE USE THE BUDGET FOR CONTROL . . . Every dollar the plant operations department spends for labor or material is accounted for by a work-order and cost accounting system. From our accounting setup we are able to issue a monthly comparison report of actual expenditures against budgeted figures. We believe this report must be available by the 10th of the following month if it is to achieve its purpose, that of expense control.

We show a typical report on page 112. It comes in two parts—labor expense and other expense.

You can see from the typical report that the budget performance is checked against the year to date as well as the current month. Actually the column "Variance, Year to Date" is the most significant because it really shows the latest score. On a monthly basis alone, what may look bad one month may turn out OK by the end of the year. You have to watch the over-all trend. This the year-to-date variance helps you do.

Distribution of labor and material expenses by accounts serves to guide activities rather than act as a strict limit. We're interested mainly in *not exceeding totals*. We don't worry about what we call a "split." You get a split, for example, when a switch has to be made on a job from company labor to a subcontract. In this case the figures are lower in "general maintenance labor" and "operating supplies," and higher in "general maintenance materials" (to which all subcontract work is charged.)

For the same reasons we don't get concerned about splits within individual accounts. This philosophy does not apply, however, to relatively fixed charges such as power, light, or gas.

There's one account under "Other Expense" that may puzzle you—"Transfer of Charges to Other Departments." This is always a credit amount. It represents the amount of labor expended by the maintenance department for work requested by other departments. It is budgeted like all other items.

We follow the rule that any department doing work for another is credited for it through a transfer of labor. To illustrate, if a production department needs a platform to work on (an expense item), the work order carries the charge number of the maintenance department (doing the job) and the production department (assuming the cost). At the close of the month, the maintenance department is credited for the labor, and the operating department is charged. No adjustment is needed for material costs —materials are always charged directly to the department using them.

"How do we handle emergencies or unforeseen developments not provided for in the budget?" you ask. Our view is that emergencies have to be met—nobody questions that. So we revise the budget whenever circumstances warrant it. In 1949 we issued several revisions. Incidents such as a new labor contract or a big change in production schedules certainly justify a change. If there's any question, management decides whether to consider the extra cost as a variance or to adjust the budget.

The net result of our methods for reporting budget performance are the benefits described early in this article. We are gradually sharpening up our procedures to increase their effectiveness. Latest improvement under way is a letter to accompany the monthly operating report to each department head. This letter will explain major variances. For example, we might point out that a $10,000 job scheduled for the current month was postponed to next month.

Heretofore we always did this for top management. By relaying these explanations in greater detail to department heads as well, we save everybody time. Formerly on out-of-line items the plant engineer would ask us "Why so high (or so low)?" Then we'd have to dig back for the facts. Now we beat him to the draw by making the analysis along with the report. And we can do it more completely.

This practice of highlighting the unusual items in a letter is promising some worthwhile results, for both the present and the future. Its immediate effect is to help department heads understand what they have spent, and have left to spend, and to point out items or excesses that otherwise get buried in a total.

All these claims go double when applied to our plant maintenance operations. Dealing in a type of work noted for its unpredictables, our fixed budget procedures have eliminated continuing complex adjustments. Best of all, we're now able to call the shot on what plant maintenance should and will cost us. And we are able to hit pretty close to the bull's-eye. What more could one ask?

CONTROLLING MAINTENANCE COSTS . . . begins on page 104

5. SYLVANIA ELECTRIC PRODUCTS INC., tells:

How We Adjust Our Maintenance Budget to Production Volume

By H. WARD ZIMMER • Executive Vice President
Sylvania Electric Products Inc., New York

WE HAVE A SYSTEM of variable budgets that keeps our maintenance costs in line no matter what volume of production we have. We developed it because our company and our industry are in a constant state of change and growth. Future production levels just can't be forcast with real assurance.

We think the major value of our variable maintenance budgets is obvious. We don't compare our costs with what we'd guessed they'd be, at a guessed-at volume of production. We compare them with what we know they should be, at known production.

Our 20 branch plants are divided into seven product divisions. This means that we've seen the system work in plants varying in size from 400 to 2500 employees. Our budgets have controlled the maintenance costs of plants varying in age and condition.

Since each of our divisions makes a different product, we've also seen it work in many different kinds of plants. And since each plant develops its own budget, we know the system will work for a single plant as well as it does for 20.

Our cost control program really keeps costs closely in line without hamstringing the plant managers and maintenance men with a lot of rigid policies. And we like it that way. For with a minimum of paperwork, we can tell the one thing we must know: what our maintenance costs were, compared to what they *should have been*, for the activity of each plant.

HOW WE MAKE UP THE BUDGET . . . The key to our control of maintenance is our system of variable or flexible budgets for each plant. We divide maintenance into three phases: mechanical maintenance, electrical maintenance, and occupancy (or the total cost of running and maintaining the building — maintenance labor and supplies, utility expense, taxes, insurance, heat, light, etc.).

Depending on the size of the plant, there are from one to three foremen handling these three phases. They report generally to the plant manager, although some managers prefer that they report to the production superintendent.

We make up a variable budget for each phase, in each plant. They're all made up in the same way; but to illustrate, let's run through the development of a mechanical maintenance budget.

Before each year begins, the plant manager, his cost man, and the mechanical maintenance foreman set up the yearly budget. They have before them historical information on just exactly what mechanical maintenance has cost them over the years, at various levels of production. These cost totals are made up of fixed costs and variable costs.

We know, for example, that a certain minimum crew is needed. You cannot lay off skilled maintenance men during a slow period. But maintenance material and supply costs do vary to a great extent with volume. Two- or three-shift operation means more machine repair, more heat, more light, more electric power. And there are other costs which are

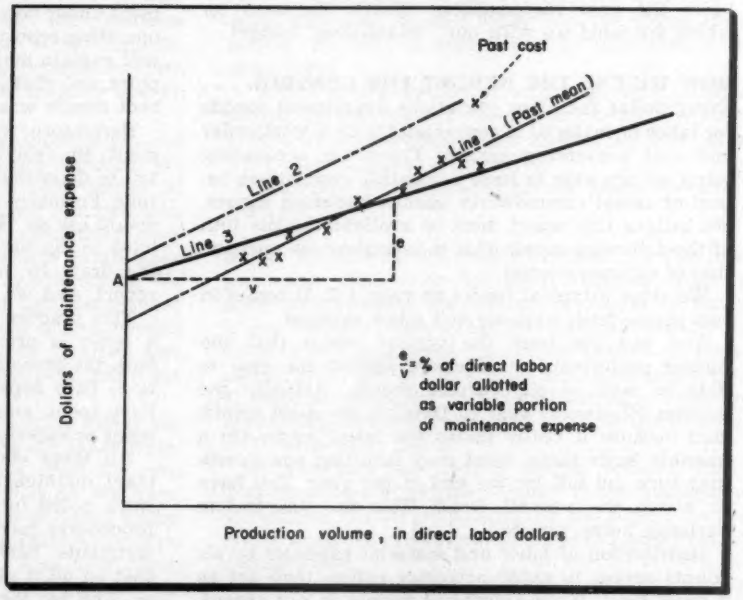


FIGURE 1 • Finding the budget formula.

in the "twilight zone"—partly fixed and partly variable. As you'll see later, we don't have to know exactly what our fixed costs are.

The men also have before them the volume level, in terms of standard or allowable direct labor *dollars*, assigned to the plant for the coming year. This direct-labor-dollar figure is developed by the plant cost department, from the plant's assigned production task.

We use the direct labor dollar as our unit of volume because it is simple and convenient. For budget purposes, the direct labor *hour* might be more accurate, because it eliminates wage rate fluctuation. Since we need the dollar figure for many other purposes, however, we use it here.

On the basis of the historical figures, then, the budgeteers try to establish what mechanical maintenance is going to cost in the coming year, at various levels of production. To simplify this task, in all of our plants those who make up the maintenance budget have been trained in the use of a simple graphical tool.

They make up a chart (see Figure 1) with dollars of maintenance expense as one axis, and production volume (expressed, remember, in standard or allowable direct labor dollars) as the other. They plot on the chart as many past values of expense vs. volume as needed. (Just how far back into past costs they go is a matter of judgment. The chart for the past year is usually a good starting point.)

The best straight line through these scatter points establishes the mean of mechanical maintenance costs in the past, at every level of production. (See line 1.)

Then they consider: In the past has the budget been too hard to meet, no matter what the volume level? Perhaps we should move the whole line up, without changing its slope? (See line 2.)

Has the budget been loose at high production levels, reasonable at average levels, and strained at low levels? That would indicate that the slope of the line should be changed. (See line 3.) They then take into account past expenditures which will not recur. If the maintenance stockroom layout was changed last year, the expense of this will not enter into this year's budget. Special expenses that are expected in the coming year also enter into establishing the line.

Bearing all these factors in mind, the budgeteers establish a new line on the chart which represents their best possible estimate of what the expense for mechanical maintenance during the coming year will be at every reasonable level of production.

Assume that line 3 is adopted as that estimate. The point where that line intersects the "expense" axis (point A) is considered the fixed expense of mechanical maintenance. You can see now why we don't have to know, item by item, what fixed expense is made up of. We simply "back into it."

The area above this fixed expense level represents the variable costs. At any volume above zero production, mechanical maintenance must be allowed an additional sum to absorb this variable expense. This sum is calculated as a percentage of allowable direct labor cost.

The percentage figure used is obtained from the slope of the established line by dividing the increase (e) in maintenance expense allowed for any given increase (v) in direct labor dollars by that increase in allowable direct labor dollars. The additional sum allowed is equal, then, to the direct labor dollars times this percentage.

The plant men making up the budget have at this point arrived at a budget formula: Mechanical maintenance will be allowed a fixed sum (A dollars), *plus* a certain percentage of the allowable direct labor dollar spent during the year. Then, given the projected volume for the year it is simple mathematics to determine the mechanical maintenance budget for the year.

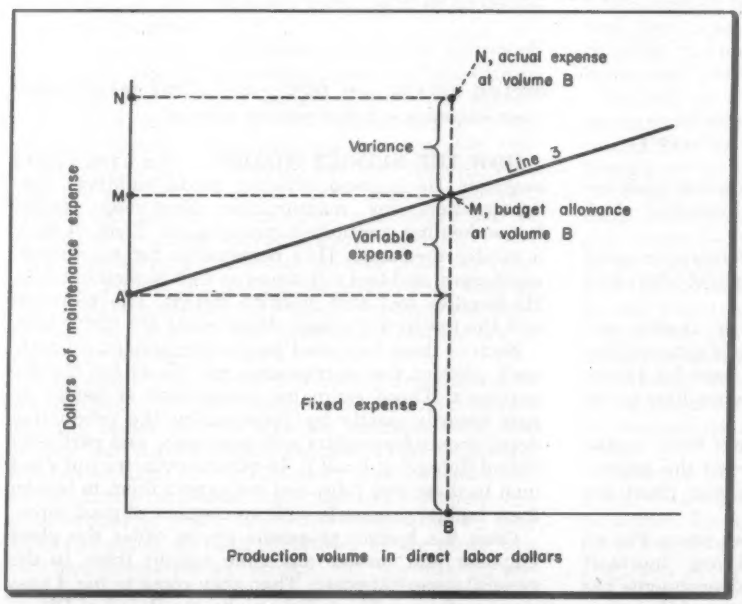


FIGURE 2 • Checking expenses against allowance.

Both the formula developed and the dollar figure based on the formula are submitted to the divitional general manager and the central office for approval.

Permanent property additions are not included in this budget. A separate budget is made up for all plant additions which are to be capitalized.

HOW WE APPLY THE BUDGET . . . The foremen actually work to a monthly budget. Each month a volume for the month is assigned each plant by the divisional general manager. This monthly assignment varies each month during the year. It is made up on the basis of historical monthly sales patterns and a sales forecast.

It is again simple arithmetic for the plant cost department to reduce this assigned volume to an allowable direct-labor-dollars value, plug it in the budget formula, and arrive at a "budget allowance for January." The maintenance foreman is notified of this allowance. Then it is

CONTROLLING MAINTENANCE COSTS . . . begins on page 104

sent, together with the rest of the plant budget to the central office.

So you can see that our variable budget is a tool which, once the formula is established for the year, can give us the maintenance expense allowance for any production level at a moment's notice.

HOW WE USE THE BUDGET TO CONTROL EXPENDITURES . . . Control consists simply in our checking whether or not each maintenance function stays close to its budget allowance. Let's refer to a chart (Figure 2) to show how we do it.

Suppose, for example, that the production volume (see horizontal scale) assigned to plant #16 the month of January is $B. That means that the number of units of production assigned to the plant will cost $B in direct labor cost. The cost department runs through the formula established for, say, mechanical maintenance, and comes out with a budget allowance for mechanical maintenance of $M for this planned volume.

At the end of the month, each plant submits a "Manufacturing Cost Report" to the division general manager and the central office. This report lists the actual maintenance expenses of each of the three phases of maintenance. These figures are assembled by the cost department.

Suppose that this actual expense is $N. The variance is $N — $M. This variance is entered alongside the actual expense figure on the Manufacturing Cost Report. When the division general manager and the central office see this variance, it is an automatic red flag. If the amount of the variance is of any size, we ask the divisision general manager, "Why?"

There may be some reason why the plant did not produce the planned volume. Or it may have exceeded that volume. In such event, the allowable maintenance cost is recalculated at the end of the month, based on the actual production volume.

The foreman is responsible only for variance between his actual costs and this adjusted bogey.

Sometimes there is an unusually large variance caused by some unexpected or unforeseen expense which was not included on the budget. This does not distort our control. Here's why: We do not provide any "kitty" to take care of expenditures of this type. All such expenses are considered an "extra," above the budget, and must be OK'd by the central office.

When an unusually large variance arises, our attention is called to this unexpected expense. By subtracting the amount of the extra from the total variance we can see what the variance would have been if the unexpected expense hadn't been incurred. This remaining part of the variance is the part that we really consider in our control operations. So you can see that a large variance need not necessarily mean that the plant manager and his maintenance foremen have slipped up.

6. THE CLEVELAND GRAPHITE BRONZE COMPANY says:

Maintenance Know-How Makes Our Budget—and Makes It Work

By WILLIAM G. LAFFER
Vice President in Charge of Manufacturing
The Cleveland Graphite Bronze Company, Cleveland

WE DON'T KNOW ALL there is to know about maintenance cost control—even in our own company. And we're not sure we ever will.

But we do know more about our maintenance costs than we did, say, eight years ago when our plant was still new.

The budget system we're using now to monitor our maintenance costs is doing a good job. Maybe not the best possible, but it gives us a good base for future improvements in cost control, if and when they prove desirable.

Only reason there are some if's and but's in the words above is because we can't predict the unpredictable. And maintenance needs in our plant are often unpredictable.

That is true, especially in the last ten years. For all practical purposes, we haven't had any "normal" period in that time. Production in all departments has been either increasing or decreasing most of that time. And because we base our budget on forecasts of production activity (in part), controlling maintenance costs becomes a non-exacting science.

HOW THE BUDGET WORKS . . . We have a plant engineer. He is responsible for yards, buildings, new construction, the maintenance department, boiler house, heating, ventilation, painting, etc. Then we have a master mechanic. He's responsible for machinery, equipment, and tool purchases as well as maintenance. He handles tool and machine design. The toolroom and the machinery repair department are under him.

Each of these key plant people prepares an estimate each year of the maintenance job ahead for his department. These estimates are arrived at partly by past records, partly by requests by the production departments for repairs and overhauls, and partly by "blind flying," as I call it. In other words, we put good men in these two jobs, and we expect them to leaven their budget proposals with an element of good sense.

Once the budget proposals are in order the plant engineer and master mechanic submit them to the general superintendent. Then they come to me. I pass them to the president. Eventually the Board of Directors considers all the proposals in the light of the

THE CLEVELAND GRAPHITE BRONZE COMPANY

MONTHLY BUDGET REPORT October, 1950

Section 371 — Maintenance

OVERHEAD:	Budget	Actual	Favorable	Unfavorable
3 — Operating indirect labor	xx xxx	xx xxx	xx	—
4 — Hourly shift & overtime premium	x xxx	x xxx	—	x xxx
5 — Base salaries	x xxx	x xxx	xx	—
6 — Salary — shift premium & overtime	xxx	xxx	—	xxx
7 — Operating supplies	xxx	xxx	—	xx
8 — Tool expense	xxx	xxx	—	xx
9 — Repairs & maintenance	x xxx	x xxx	xxx	—
10 — Departmental expense	—	xx	xx	—
11 — Utilities & rent	—	—	—	—
12 — Other employee costs	xxx	xxx	—	xx
Totals (Flexible Budget)	$xx xxx	$xx xxx	$ xxx	$ x xxx
Totals & Net (Flexible Budget)	$xx xxx	$xx xxx	$ —	$ x xxx
Totals & Net (Fixed Budget)	$xx xxx	$xx xxx	$ —	$ x xxx

NOTES: (a) Standard direct labor dollars used for budget.

(b) Budget set on reported volume of Distributed Hours Section 371.

(c) Department and section heads are urged to review their budgets promptly with the accounting department for recent changes in operating methods and procedures or for clearance of any questions which may arise.

company's operating picture for the coming year.

All along the line, however, top management considers the elements of the proposals. Sometimes a little change is needed here or there. The final objective is to keep the plant at top operating efficiency and to protect the company's investment in its buildings and equipment.

Once the annual maintenance budget is approved, we break it down to a monthly basis to help control our costs. The monthly budget is based on several components—incompleted work carried over from the previous month, scheduled maintenance for that month, and large new jobs to begin that month. These jobs are normally a part of the annual approved budget, but jobs not previously anticipated can be worked in by a new appropriation.

To keep abreast of the maintenance trend we compare the budget for the coming month with that for the current month and the preceding ten months. Each month a new month's budget is added and the last of the group is dropped.

Now, just a word about the budget breakdown we use. Normally, we don't include in the annual budget items of under $100 as separate requests. They are lumped into a contingency request. Then we have a separate account for replacement, miscellaneous, and extraordinary expenses. Into that appropriation account would go items like a new dust collector, new filter and pump, painting steelwork in the plant, two awnings, rebuilding of furnace, etc. The one big object of our budgets, of course, is to keep our expenses as closely as possible to the limits prescribed. To this end the accounting department prepares monthly budget reports, as shown above on this page.

This report compares actual expenditures with budget estimates, and shows the amounts of "favorable" and "unfavorable" expenses. The form you see was issued for the maintenance department. The identical form is issued separately for plant engineering, painting, janitor service, building operations, boiler house, and yard activities.

To each of these monthly reports the accounting department attaches a breakdown of subsidiary accounts that make up the total for each item. The breakdown for item 9 on "Repairs and Maintenance," for example, includes such accounts as minor equipment repairs, machinery equipment repairs, repair and maintenance of safety equipment, painting expense, sweeper and scrap handling expense. Each account shows the totals for the current month and for the year to date.

Two facts are evident to us in the operation of our budget system. First, it's never absolute. The vagaries of business disrupt plans and budgets continually. So our plans are drawn as accurately as possible and no one gets too excited when the changes have to be made.

Second, a big part in control of maintenance costs lies in the proper selection and training of supervisory personnel. These are the people who provide the information to establish the budget in the first place. Then they are also the people who must make it work. So unless they are skilled, your budget can become more a problem than a help.

JOB INSTRUCTION TRAINING:

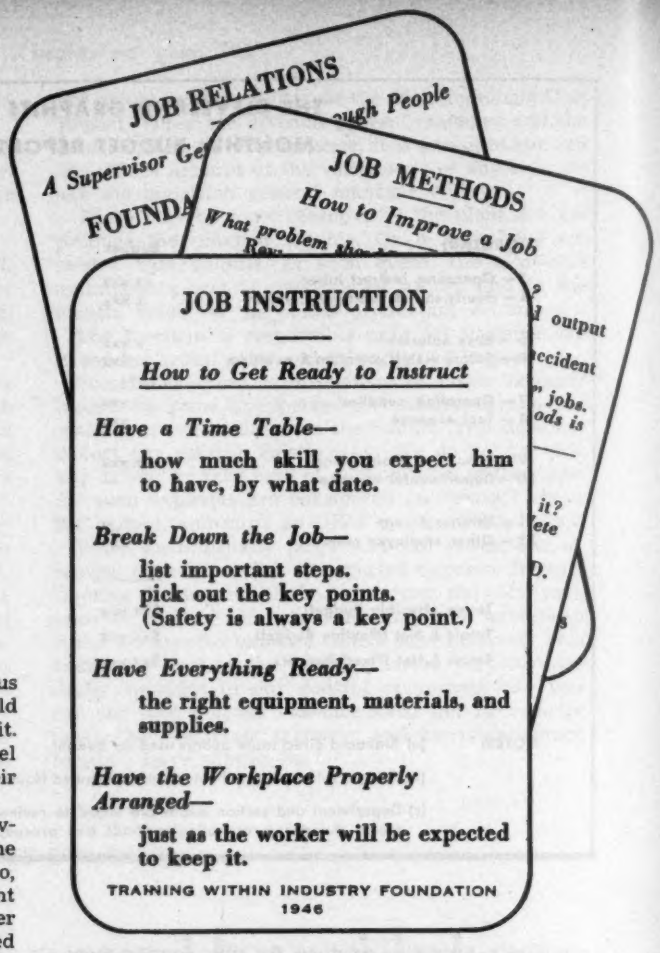
One Answer to Your Green-Worker Problem

By M. J. MURPHY,
Industrial Relations Editor, FACTORY

A LOT OF FIRMS that had almost forgotten the famous Job Instruction Training (JIT) program of World War II days are now asking what's happened to it. Their interest has revived as they begin to feel the hot breath of a manpower shortage down their necks.

They wonder whether there will again be a government training program for foremen, like the one it ran in the 1941-1945 war period. They wonder, too, whether they will have to wait for the government to do something about the problem — or whether there aren't other sources of help that can be called on—and that they can use right away.

The many firms that have *not* forgotten JIT can answer these and a lot of other questions pretty fast. Like this:


JOB RELATIONS
JOB METHODS
How to Improve a Job
JOB INSTRUCTION
How to Get Ready to Instruct
Have a Time Table—
how much skill you expect him to have, by what date.
Break Down the Job—
list important steps.
pick out the key points.
(Safety is always a key point.)
Have Everything Ready—
the right equipment, materials, and supplies.
Have the Workplace Properly Arranged—
just as the worker will be expected to keep it.
TRAINING WITHIN INDUSTRY FOUNDATION
1946

EVERY WELL-DRESSED FOREMAN during World War II wore the famous "J" cards—JIT, JMT, and JRT. Cards were reminders, given out to foremen during 10-hour training conferences. The cards illustrated are modern editions.

What JIT Was and Is

Job Instruction Training was developed by the Training-Within-Industry ("TWI") Division of the War Manpower Commission during the early days of World War II. It was the first of what many later called the "big three" of the TWI. The other two were Job Methods Training (JMT), and Job Relations Training (JRT).

The logic behind setting up three different programs was simple. They cover the three basic skills that every foreman must master, to do his job well —*skill in teaching workers, skill in improving methods of work, and skill in leadership.*

All three of these "J" training programs did well. But JIT really stole the show during the war. Its success was partly due to the fact that it simply came first. More importantly, though, it succeeded because it met so well the most critical need of the time—to get untrained workers into production fast by teaching them on the job.

JIT was simple, fast, and logical. Used properly, it was a sure-fire producer of good results. It tried to do only one thing: *teach key men in industry (mostly foremen) how to be good teachers, so they could pass their know-how along to workers.*

The total time needed to train a group of 10 or 12 foremen was 10 hours. The time was split up into five 2-hour sessions spread over one or more weeks.

When a foreman finished his 10 hours of training, he found he had at his disposal a tool that he could use instantly. That had a strong appeal. So did the fact that the program was a standard "package."

Possibly of equal importance, JIT was an *interesting* program for foremen to participate in. The famous underwriter's knot demonstration used in the first sesssion invariably got things off to a good start. In plant after plant, men could be seen practicing the knot, and using the "show and tell" technique their instructor had demonstrated. Every session involved active participation, too, which also helped. Even the hardened doubters seemed to catch the spirit of enthusiasm that the program seemed to generate.

By the end of 1945, about 16,000 plants had had one or more of the "J" programs. Almost 2-million men had been trained.

Since the end of the war, the "J" programs have continued to prosper, although they were promptly demobilized by the government after V-J Day. There's a difference, though. Many improvements

have been made by different individuals and organizations. And many individual variations of short-course training programs covering the same subject matter have been developed. Some of these, of course, were the property of established consultants long before the "J" programs were conceived, and influenced the development of these programs. Individual trainers who became expert in teaching JIT, JMT, and JRT also became consultants, and many others went into industry where they developed or continued their companies' programs.

In addition, the organization known as the TWI Foundation was set up, sponsored by a number of contributing companies. The Foundation — a non-profit organization—was established to keep the "J" programs alive, to improve them by research, and to develop other training methods that might serve industry. It trains company trainers in its versions of the original programs, as do other consultants.

The men who head up the TWI Foundation are the same men who were at the helm of the wartime TWI program. Dean of the group is Channing R. Dooley, who directed the war program and is now president of the Foundation. Newest of the projects undertaken since the war is the "baby" of the "J" programs—Job Economics Training (JET), which has been nursed through a long period of development in actual plant conferences by Research Vice President M. J. Kane.

How to Get the Most Out of JIT

One of the big problems faced by any employer who uses JIT—or any other "short-course" training program for foremen, for that matter—is follow-up. Those who think that training is finished when a ten-hour conference series is finished are in for trouble. Actually, the completion of the conferences is just the beginning of the training job.

JIT, for example, has not always been successful, even though enthusiastically received by foremen in some plants. The reason: Foremen do a good job of teaching for a time, while the initial stimulation of the conferences holds up. Then they backslide, because no one has thought to keep after them, and to help them maintain interest.

Follow-up can be of two main types: (a) Immediately after training, the conference leader starts a regular program of visits to the foremen, to review their progress, and help them where help is needed. Visits need not be frequent, but should be kept up if results are to be consistently good. (b) "Refresher" training sessions are also good, to supplement personal follow-up. These are usually much briefer than the original conferences, but not always. They do a double job. They remove the cobwebs from the foreman's recollection of the details of the original training sessions. And they help to restore his interest—to "sell" him, really—on the value of *applying* what he has learned in his everyday work in the shop. Right now, many firms are running refresher courses for foremen. It's a very timely activity.

Another big problem is what to do about foremen who didn't have the original training. Follow-up is important here, too. The best procedure is to see that candidates for foremanship get the training before they take their jobs. The second best thing is to see that new foremen get the training as soon as there is a large enough group to justify running a special conference. This is all right for larger firms; but it doesn't work well for smaller ones. There it's important to get the men ahead of time.

How JIT Has Spread

JIT and, to a lesser extent, JMT and JRT, have become internationally known since World War II. The JIT instructor's manual, for example, has been translated in 16 different languages. Right now, the International Labor Organization is working on a program for India—an imposing job, since some 60-odd dialects are spoken in that country.

England reports that, as of October, 1950, 2747 companies have conducted one or more of the three basic "J" programs, mostly JIT. Over 296,000 supervisors have had the 10-hour training.

France has had a representative in this country recently, getting basic training at TWI Foundation headquarters in all the programs.

Holland has also done something of the same sort. It imported an American expert to do the job.

An interesting result of the spread of the "J" programs, say those who have watched and helped it to happen, is that they have been one of our better ambassadors of good will. In effect, "J" training is a good example of democracy at work. It's hard for employers in some countries to take at first. Those who are used to the "master-servant" idea of employee relations find it difficult to get into the highly democratic groove of American training. Once over this hurdle, though, they are reported to be enthusiastic, and more receptive to ideas based on American management philosophy.

What Government Is Likely to Do

As the "state of emergency" grows, the question naturally comes up: *Is Uncle Sam going to "nationalize" foreman training, as in World War II? If so, will there be the equivalent of another TWI Division of another War Manpower Commission?*

If things get tough enough, that's probably what will happen. And when it happens, there is a good chance that the now-private TWI Foundation will be "taken over." This has already been discussed with some government officials, and a truce seems to have been declared for the time being.

The TWI Foundation, whose views are probably not unlike those of most private consultants, has stated it feels industry can carry on its training activities best without the aid of government. To date, this view has been accepted in Washington. When it may change, no one knows. The moral for management in the meantime is simply this:

Don't wait for Uncle Sam to help you train. Do it yourself, or with private help, right now.

For a good example of how one company — Boeing Airplane — has developed its own training program, turn the page ——→

1 Richard Eberl, 19, from Dawson, N. D., applies for work at Boeing personnel office in Seattle. He has no skills that Boeing can use, but seems to be a good prospect. He is hired as a trainee.

2 Richard goes into the preliminary phase of the program. Here he is in Dept. 215, where all trainees start. Teachers are assistant foremen who have had Job Instruction Training (JIT).

On- and Off-the-Job Training Makes Mechanics From Scratch

BOEING AIRPLANE COMPANY, Seattle, is already faced with the problem of training mechanics virtually from scratch.

The pictures on these pages tell how the company is solving the problem with the help of the Seattle public schools.

To speed up training without loss of quality, Boeing combines on-the-job and off-the-job training ingeniously. The on-the-job or "preliminary" phase is done in the plant. It lasts from three to five days, and does two things:

It teaches trainees how to rivet and use the simpler machines they will have to operate.

It acts as an aptitude test, in that it quickly shows up trainees who lack the mechanical aptitudes needed for further training for the tougher jobs.

The off-the-job training is given in a near-by shop owned by the public schools. This training lasts two weeks, and trainees are paid by Boeing. Instructors are selected from among Boeing employees, but paid for by the school system. The schools provide building, machines, and tools. The company provides the parts—the same used in the plant.

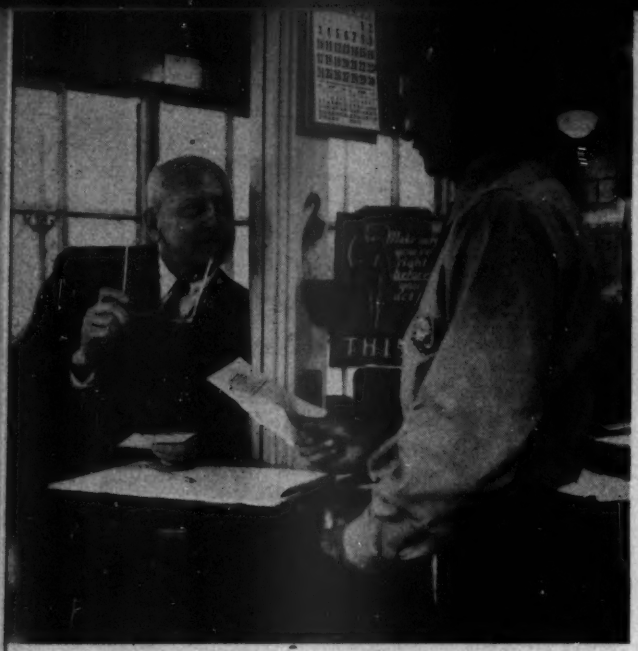
Classes now run on a two-shift basis, with some 250 trainees enrolled.

4 Training in use of hand tools, like this portable drill, comes in the first week. Parts Richard is working on are scrap, but future trainees will be making small finished products for use in plant.

3 His on-the-job training in Dept. 215 shows that Richard has good mechanical aptitude. So he is graduated to the second phase—off-the-job training in a special shop run for Boeing by the Seattle public schools. Here his instructor tells Richard the good news, and gives him his new shop button. The company pays trainees their regular rates for time spent in school.

5 In second week, Richard learns to use bigger machines, like this power-driven nibbler. He finds his teachers know their stuff. Skilled Boeing mechanics, they've had 15 hours of teacher training.

6 Back in the plant, Richard goes to work in Dept. 905 on a fairing for the B-47 power pack. His new assistant foreman breaks him in on the job, helping him transfer what he learned in school.



Ade is given safety glasses . . .

Here's Ade Livingston of Midland Steel Products at the American Welding gate house. "You've got to wear safety glasses in this plant," the guard tells him. "Beat you to it," says Ade. "My job is safety too, so I'm wearing my own, ground to my prescription. Now, I'd like to see Mr. Hudson W. Reed, Jr., your own safety director."

(Everyone at American Welding must wear safety glasses in the plant. They are furnished free to workers. Visitors pick theirs up, freshly sterilized, at the plant gate house. If a worker forgets his own, he can get a sterilized pair from stock.)

. . . meets Hud Reed in the yard . . .

Ade meets Hud in the plant yard. Reed is almost violent as he objects to the FACTORY cameraman's attempt to photograph the sign telling how long it has been since a lost-time accident occurred.

Hud is superstitious of anything that might jinx his safety record. Last two times the sign was photographed, accidents followed. "No picture," says Reed, as FACTORY's photographer tried to shoot the sign.

Employees nearby excitedly chimed in, "Don't let 'em shoot that picture, Hud." They got their wish—no picture.

CAMERA TOUR • AMERICAN WELDING & MANUFACTURING COMPANY

Selling Safety Down the Line – for a New World's Record

By ROBERT A. DILLEY • Field Editor, FACTORY

BY NOVEMBER 20, 1950. American Welding & Manufacturing Company, Warren, Ohio, tallied up 968 days without a lost-time accident. That's nearly 2-million man-hours—a new record for "miscellaneous companies" in the sheetmetal industry (National Safety Council's classification).

To set this record meant work—for American Welding's management and for its 400 safety-conscious employees. The record is impressive because the company's heavy operations make its plant a hard one to keep safe. The work includes punching, stamping, rolling, and forming.

Curious about how the record was set? So was A. J. Livingston, safety director of The Midland Steel Products Company, Cleveland. He went through the plant to find out how American Welding did it.

Here's what he learned about the method: Top management itself is convinced that it needs a safe plant. It sells that down the line to its workers. The whole plant operates like a giant safety committee. Nobody is exempt—or wants to be.

Here's what he learned about the results: The most important result, of course, is American Welding's phenomenal record. It's been almost three years since the last lost-time accident. But that's not all.

Eight years ago, compensation costs were about $1.20 per 100 payroll dollars. Now the rate is down to 46 cents.

. . . and enters the plant. Right away he sees one reason why it's a safe plant.

Biggest part of Hud's job is to get the employees to think and act safely. According to Hud, it takes constant effort. Take, for instance, a plant safety meeting like this one above. Here all plant people gather on company time (15 minutes each month) to hear Hud Reed, and often the company president, William J. Sampson, Jr. They talk safety like other men talk about hunting or fishing. Reed covers the use of inhalators, fire equipment, guards, and anything else that seems important at the time.

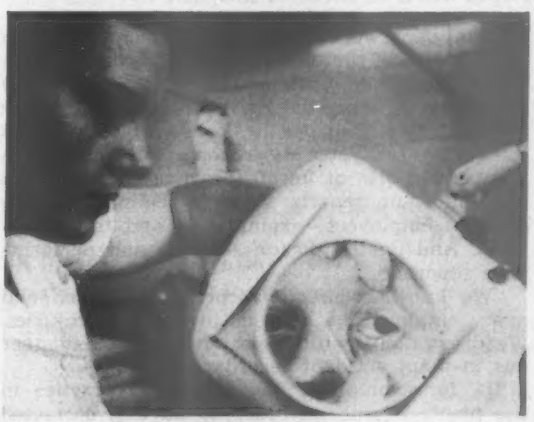
Sampson tells what "the top" is thinking, and encourages the men to continue the good work. When the plant won its first National Safety Council "S," he told the workers it meant more to him than the receipt of the Army-Navy "E" because the "E" stood for excellence in production. But the "S" meant that not one man had lost one hour from work because of an injury in the plant.

Besides big plant meetings, there are small departmental meetings. Often foremen hold meetings on their own initiative. Most of the time Reed calls the shots. Unsafe practices are discussed, as well as the ways to improve safety.

Safety starts for each man as soon as he takes a job . . .

Safety training starts the first day a man comes to work for American Welding. First thing, the new worker gets a complete physical examination, to make sure he is able to work safely.

Then he gets what Reed calls the "safety injection." A foreman explains the company's safety rules. They read the rules together. They discuss them. Then the new workman signs a statement saying that he understands the rules.



The slightest injury must be reported immediately . . .

A big point is made to new workers of the need to report promptly to the well-staffed and well-equipped dispensary—for even the slightest injury. Minor eye injuries, for example, despite enforced use of safety glasses, are a problem. Sparks and metal scale are the biggest offenders.

Ade Livingston watched the plant nurse remove a speck of scale from this worker's eye. Equipment is good. And the nurse skilled. In spite of pre-

SELLING SAFETY . . . begins on page 124

cautions, the plant doctor gets about three eye cases a month from the plant.

Reed's strong pleas to the workers to get prompt care for the little things have gotten results. Back in the early 40's, plant people suffered more than 1000 minor accidental injuries in four months. Today they average only 51 in the same period. Reed figures that if they take care of the little accidents, the big ones won't happen.

What the Nurses Do · Nurses are trained to test eyes, give routine physical exams, take (but not interpret) X-rays, and perform similar duties. When a doctor's needed, the nurse so recommends. Nurses handle all group insurance claims.

What the Company Pays for · Safety shoes are provided for employees at cost. So are gloves. The company pays for eye examinations, prescriptions, and eyeglass frames. Lenses are bought by the employee. X-rays and blood tests are made free.

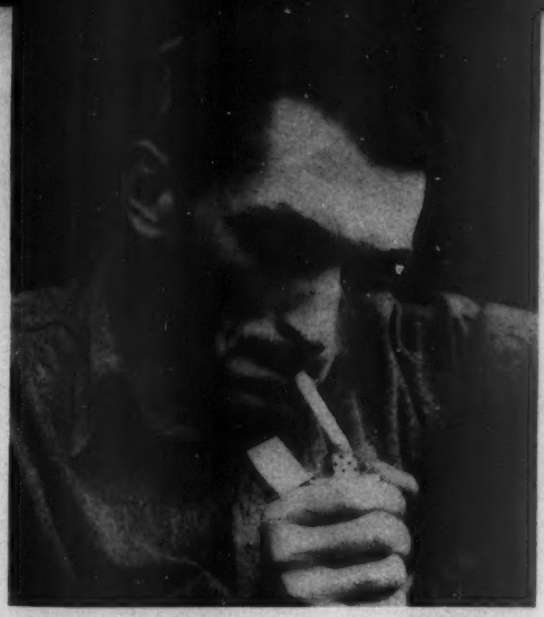
Paperwork is useless, unless . . .

"Safety paperwork," says Reed, "can be a trap and a waste of time. I have lots of forms to fill in or have filled in. Look at this string." And Ade Livingston is impressed by the string of 17 safety forms. "All this paper is useless unless it does something for you. My reports fall into three groups: Reports of unsafe practices in the plant and follow-up reports. Reports dealing with individual employees—examination and injury reports. And finally, doctor's reports and performance reports.

"We know, from our records, what each and every employee has cost us in terms of injuries. We discuss this with 'repeaters.' They endanger our in-plant accident record.

"If, for example, I find an unsafe practice in the plant, I issue an order to have it corrected immediately. And I want a report on the correction as soon as it has been made. Then I go out and check for myself. I don't rely on reports to tell me how safe the plant is. Reports can give you a false sense of security.

"We've found that part of our safety job is to keep tabs on injuries to our people outside the plant. Even though a man is injured outside the plant, on his own time, we know it's to our own interest to get him back to work as soon as possible. So we report that injury. It covers a loophole in our plant accident report."



An inscribed lighter was the award . . .

"We use a lot of gimmicks to put 'glamour' into safety. The cigarette lighter this chap is using, for example, was given to him when we won our second National Safety Council "S" award. But before we gave him the lighter, we inscribed it for the occasion. Now whenever he lights up we hope he remembers why he got the lighter.

"Once a year we get the results of a year-long departmental contest. Each department that had no lost-time accidents during the year gets a plaque to hang somewhere in its area. Believe me, the men prize those plaques.

"In our plant publication, *The Ring Leader*, we use every chance to sell safety. Not only do we encourage safety in the plant, but we stress safety in the home, in the school, and on the highway.

"Each month the National Safety Council puts out a booklet, called 'The Safe Worker.' Every man in the plant gets a copy as he goes through the gate that night. We want him to take it home. He'll read it there and his family will read it.

"I can recall some other kinks we've used.

"During the war we hired two men who were totally blind. They were excellent workers, but our shop is tough to get around in—especially without eyes. So we asked these men to wear red caps. When they needed help, other workers provided it. You can't imagine what an experience that was to men who weren't wearing their safety glasses at the time.

"Years ago, when a foreman's department had an accident to mar his record, we'd hang a funeral crape on his office door. And my assistant and I would travel through the plant wearing black neckties. Even the nurses would exchange their white hankies for black ones.

"On other occasions we'd park a beaten-up dog house in the department at fault. Nobody wanted that thing in his work area.

"When someone recognized our efforts—like the National Safety Council did when it gave us the "S," or our county's safety group does—we hold a plant rally. It's like a college pep rally—everybody gets keyed up.

"It all makes safety a challenge to everyone."

Ade and Hud examine a new shear guard . . .

Ade and Hud stopped long enough to look over a new guard at a shear. It's on rollers so it can be moved easily to protect passersby from material in process.

Hud informs Ade, "We tell our workers that a machine guard is only 17% effective. Accident statistics will bear me out. It has been said that 83% of all industrial accidents are the result of human failures. So we've sold the idea that the machine is safe if it's used right. Some workers in industry try to beat machine guards. But our workers know they can't—so they don't try.

"Better still, they know that personal safety contributes to a happy, useful life."

Livingston likes an idea and makes a sketch . . .

After looking over an alligator shear guard, Ade decides it could be used in his shop. He stops to sketch it. He asks Hud if he can steal the idea.

"Go right ahead," he's told. "There are no trade secrets in safety. Copy anything in the plant you like. Matter of fact, I'll tell you where we got the design for that guard.

"I wrote letters all around and received in return 14 drawings on shear guards. I combined the best features from each drawing and developed this guard. Now do you see why I say there are no secrets in safety?"

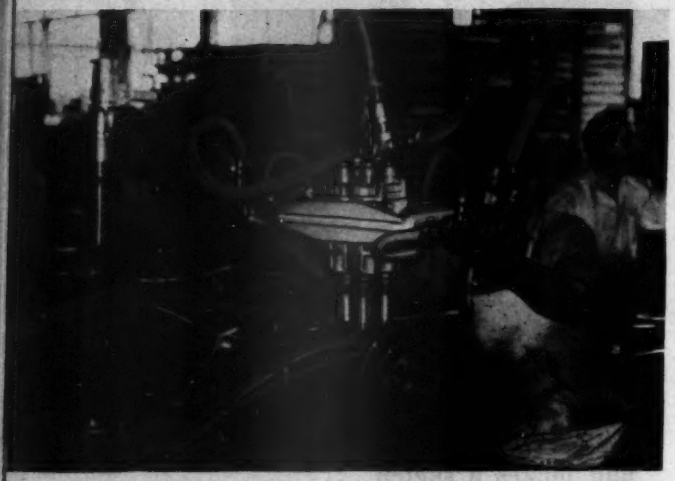
"Yes, you can go to any safety man or organization and get help," answers Ade.

While walking safely past a spark shield, Livington asks Hud . . .

"Since there are a couple of ways to interpret the term "lost-time accident," which interpretation do you use?"

"If a man can't report for the next scheduled shift he would normally work on, that's a lost-time accident in my book. We don't bring him back on a stretcher, or crutches either, to beat the system. Keeping score in plant safety is like writing your own golf score—your only kid yourself if you cheat."

OPERATING SHORTS



Multiple-Spindle Nut Runner Cuts Assembly Time by Two-Thirds

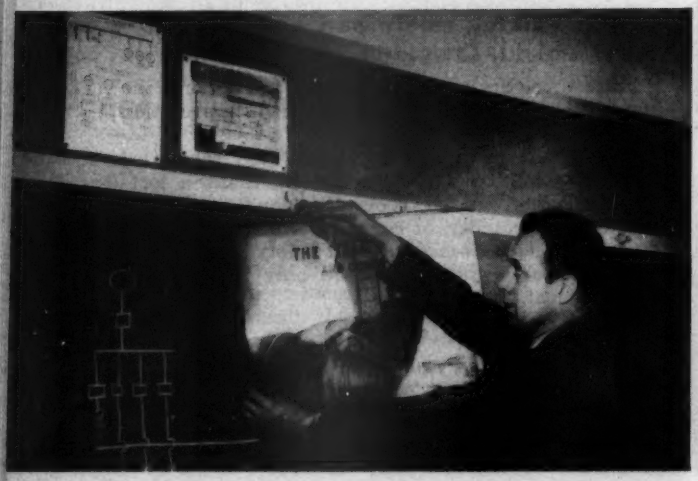
"Four at a time" tightens nuts quickly without misalignment, Ford has found. The problem at Lincoln-Mercury Division of Ford Motor Company, Metuchen, N. J., was running down nuts on the rear axle assembly, springs, and plates.

Old method, after parts were positioned, was to start nuts by hand, run them partly down, one by one, with an electric nut runner, then give them the final tightening.

New method uses a multiple-spindle electric nut runner, suspended above the assembly and counter-balanced for easy handling. The nuts are started by hand, as before, but all of them are run down and tightened in one operation. Simultaneous tightening prevents misalignment and saves about 65% on time.

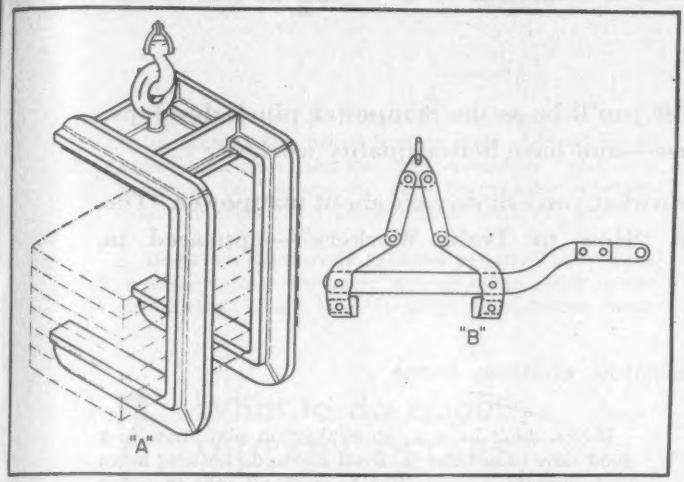
Two-Way Radio Controls Fork Trucks for In-Plant Materials Handling

Heart of the materials handling system at Johnson & Johnson, Metuchen, N. J., is a master short-wave station in central dispatching headquarters. Seven fork trucks, equipped with two-way radio sets, handle all materials (except order picking) in the 207,000 square feet of the J&J plant. The dispatcher has a space layout chart and stock record location cards. He always knows the exact location of both stock and trucks. Deadhead trips, idle time, and general confusion are eliminated. Another saving is in paperwork. It is no longer necessary to work out assignments in advance and give drivers written instructions. The installation cost J&J $3200. The company says dollar benefits are large.



Classroom for Trainees Has Everything

If Westinghouse trainee engineers don't learn their lessons, they can't blame it on their surroundings. Modern rooms in the new Westinghouse educational center provide the best in comfort and convenience. Blackboards like the one shown are made of etched glass for long life, colored green for eye ease. Teachers use yellow chalk for best readability. Cork stripping above gives space for posting notices and exhibits. Adjustable hooks and eyes accommodate posters and charts. Furniture is comfortable—but not too comfortable. Fluorescent lights provide nothigh-level illumination. And—the last word—a cubicle in the back of the room houses a projector for use in either of two adjoining classrooms.



Homemade Pick-Up Device Cuts Out Manual Handling

This self-loading pick-up device, used with an electric hoist, was homemade at Riverside Metal Company, Riverside, N. J. It looks like two giant C-clamps tied together, handles six 200-lb. metal bars at a time. The bars are stacked on pallet blocks, device slips under the load as a fork truck would, and the crane picks it up. Eye for the crane hook is near the open side, so load is safely cradled at the back of the C. The company suggests that a similar device could be used for other materials—textiles or lumber—to cut out manual handling. It was made by bending two flats into C shape, tying them with cross straps, and reinforcing them with additional flats, all welded together. The companion device (shown at "B") works like tongs, permits one man to handle single bars for stacking or feeding machines.

Remote Control and Television Run Operation — Inside Plant and Out

From deep inside the plant of Fisher Body Division of General Motors, Pittsburgh, the operator of a scrap baler controls the entire baling operation. A control panel governs conveyors bringing scrap to the baling area, basket that dumps scrap into the baler, compressor, and conveyors that carry baled scrap to gondolas on the track outside the building. A television screen beside the operator is focussed on the discharge end of the scrap conveyor, over the gondola. It shows when the car is loaded and ready to be moved, so he controls baling and delivery operation accordingly. Fisher calls it "the world's most exclusive TV show."

Grab Post Protects Controls on Fork Lift Truck

When the fork truck driver swings himself up onto his truck, he is likely to grab the handiest thing for a boost. If the "handiest thing" is one of the controls, it's too bad. A simple solution worked out at the Naval Supply Depot, Bayonne, N. J., is a boarding grip, or grab post. It was made from a piece of ¾-in. round bar stock about 12 inches long, bent and flattened to fit. The post is bolted to the side of the fork truck where it will be handier than the controls to help the driver up to his seat.

What You Can Do Now to

The lower your labor turnover, the better off you'll be as the manpower pinch develops. You'll save recruiting and training expense—and have better quality workers.

This is the third of FACTORY's checklists on what you can do *now* about manpower. The first two—"How to Find Workers" and "How to Train Workers"—appeared in last month's issue (pages 92 to 95).

BY M. J. MURPHY • INDUSTRIAL RELATIONS EDITOR

1 What to do about WAGES

1. **Get your basic wage structure in order.** This doesn't mean you have to pay the fanciest wages in town. Nor does it mean that you need an elaborate system to do what needs to be done.

Your immediate aim should be to make sure you don't lose workers by getting caught unprepared by a wage freeze. And here you can benefit from what went on in World War II. Wage stabilization rules then required every employer to submit "wage schedules." These were lists of all the jobs in a plant, with all the rates paid for those jobs.

Regardless of what else is done in any future wage freeze, you can count on having to submit similar schedules as one basic requirement. You can also count on trouble if your schedule shows that rates scatter all over the lot, with little relation to the skill and experience required by your jobs.

Your trouble will come because wage-freeze rules will undoubtedly prevent you from cleaning up the bad spots in your schedule the way you would like. The rules will certainly prevent you from just handing out big raises to keep your workers when fairer-paying competitors beckon.

To make a good wage schedule, you need at the very least:

- A set of job descriptions for all your jobs. They don't have to be fancy. But they should give enough information so an outsider can understand what each job is really like.
- A set of rates for these jobs that go progressively higher as the jobs get more complex and important. It's best to set rate ranges, with enough room on the high side so you can grant raises without running into the ceiling too soon.
- Facts about rates paid by other firms. You don't have to lead the parade, but you can't afford to be too far below competition.

If you have a job evaluation plan, your job descriptions and rates are probably already related to one another in some more or less orderly way. But it's still worth checking your plan to be sure it hasn't been allowed to go to seed.

If you don't have a job evaluation plan, now is a good time to put one in. Even if you do nothing more than appoint a committee to rank all jobs in order of worth to the company from highest to lowest, you will have accomplished a lot. This simple kind of "evaluation" will show up the big inconsistencies, and give you a chance to do something about them.

2. **Get your wage policies in order, too.** In a wage freeze, sound policies are just as important as a sound wage structure.

Policies should be in writing. And what is written should be consistent with your actual practices. This is where some employers ran into trouble in World War II. They "idealized" their written policies, and didn't live up to them. Then they were caught by wage stabilization "past practice" rules that made them follow practice instead of policy.

A good example is policy on merit increases. Employers had to have a plan (policy), and had to be able to prove the plan conformed to past practice. If they had no plan or couldn't prove it conformed, they were severely limited in giving merit increases. The famous "5 and 10" rule applied: No individual employee could get a merit raise of more than 10¢ an hour per year. And the total amount of all increases granted in a year could not average more than 5¢ an hour for all employees under War Labor Board rules.

Of course, no one can be sure these same rules will apply if there is another wage freeze. But the *principle* is sure to crop up in some form again, as a key part of stabilization planning. At any rate, it costs little to review wage policies now, and to make sure they conform with practice. It makes good sense and good business, regardless of what the future holds.

Besides merit increase policies, consider these other items that can be of almost equal importance in keeping workers satisfied:

- Overtime, especially Saturday and Sunday (or sixth and seventh days worked in the workweek).
- Bonuses, wage incentive plans, and other forms of special compensation in addition to base rates.
- Promotion, with special emphasis on the amount and timing of wage increases granted when workers are moved up.
- Trainee rates and promotional plans.

Keep Workers on the Job

These are not all-inclusive, but they are likely to be high on the list of trouble spots. Add others as local experience dictates. And, whenever there is a union in the picture, be sure to consider whether policy changes must be negotiated with the union.

3. **Don't overlook your salaried people.** There were too many "forgotten men" among white collar workers during World War II wage stabilization days.

Check over salary schedules and policies the same way you review those of your hourly workers. Are salaries reasonably in line with competition in the community and area? Have you kept up with increases in the cost of living? How about merit increase policies and practices? Promotions, overtime, bonuses? All are important. And all should be spruced up now, and summarized in writing. Later may be too late.

2 What to do about MILITARY DETAILS

1. **Prepare for heavier impact of the draft.** The news of upward revision of draft quotas is already here. And, if past experience is a guide, there will be more sudden (and painful) revision to come.

To keep the key men you really need, get your relations with local draft boards in good shape. These boards have the real authority in the Selective Service setup. No matter what policies Selective Service authorities come up with, you won't be able to get everybody deferred. And it's not smart to try. You have to give to get.

The best approach is one of complete frankness. When a man is in a critical job, and can't be spared, put your case strongly. But be honest in admitting that men can be spared, where that is the case. Only by integrity can you build up confidence and respect that will assure you a fair hearing from the local draft board when you really need deferments for men you can't replace.

It is equally important to have an accurate and up-to-date inventory of men who are or may be draftable. This may sound like an old story by now, since everybody has been stressing it, including Selective Service authorities. But there is still a lot of complacency about the draft in many parts of the country. If this has been true of your company, it's time to shake out of complacency and make your inventory.

You can get much help by using a special form provided by Selective Service. The form is called the Civilian Users Force Analysis Sheet (S.S.S. Form No. 170). It is not required, but the Selective Service people feel it will help you to lay your plans. If you make one out, they would like a copy, too, to help them in making their own manpower analyses. This is voluntary also.

The analysis is a summary sheet which brings together your total work force figures by sex and general levels and types of skill. There is space for listing probable losses of draftable male workers by ages, and in their probable order of separation. Age columns go well above present legal limits (age 25). This is admittedly unofficial, but should be a realistic warning of the heavy drain the "second phase" of the draft will cause, when it comes.

2. **Prepare for losses of workers in military reserve units.** Here the deferment rules are clearer at present than they are for the draft. The Defense Department lists specific industries and occupations as "essential" and "critical," respectively, to guide employers in asking for deferment of individual reservists. But these guides do not apply where whole units are being called up. There you have no chance of getting a man deferred.

The same general principles that apply to relations with local draft boards should obviously be followed in asking for deferments of reservists. If you gain the confidence of military authorities in your integrity, you can be sure of serious consideration when you ask to keep men in really key spots.

In the long run, it's sound to be pessimistic where reservists are involved. They are trained and experienced military men. Expect them to be called early, in the event of a step-up in mobilization. If any of these men in your plant are so important that you feel you want to fight for them to the last ditch, start your campaign now. If you make a good case, you may save a few. If you don't half try, you're almost certain to save none.

3. **Get used to thinking about your work force in "Manning Table" terms.** Manning tables were developed by the War Manpower Commission and Selective Service during World War II to help employers to inventory their total manpower needs, and to make military withdrawals more orderly. The tables turned out to be good management tools. They were of great help to employers at the time, and they can be equally useful again.

Basically, a manning table analyzes *jobs*—not workers. It includes such items as: job title; job description; training time required; percentage of plant (and department) workers on the job; sex of workers on the job; shifts on which the job is worked; sources of recruits for the job; and minimum experience required.

Systematic analysis of this type is the only way to know where you now stand—and where you expect to be later. It also gives you a powerful argument to support requests for deferment, or at least delay, of induction of important workers. It's wise to get used to thinking in these terms. Then you won't be rusty when you are asked (or told) to work out analyses of this kind.

More on next page

3 What to do about PERSONNEL POLICY

1. **Review your methods of inducting new employees.** Research studies show that the biggest worker turnover takes place in the first two or three weeks of employment. Good induction procedures are needed to get more workers past this critical period.

Here are some questions to ask in your own plant: Just what *does* happen—in detail—to a worker after he gets past the point of being hired? Is he simply tossed out into the shop pretty much on his own? Or does he get a careful introduction to the company and his job—to make him feel he is part of a good firm, worth staying with? Do you have any follow-up system with the worker himself or his foreman to see how he is getting on? Is it any good? How do you know?

These are important questions. If you can't answer them favorably, better review your whole procedure for breaking in new people. Don't just think of employee handbooks or fancy films. They're fine, but good induction goes beyond them. The way the new worker is *treated* by the people he meets (foremen especially) is the most important factor.

2. **Use exit interviews to help you hold workers.** Properly used, such interviews can be valuable in two ways:

- They will salvage some workers on the verge of leaving.
- They will give you clues as to conditions within the plant that are causing workers to leave.

A good exit interview should never be routine. Nor can it be hurried. Its whole value comes from getting behind the smoke screen of general talk that departing workers often throw out in front of their real reasons for leaving. This takes time, and requires a skilled interviewer. But the results are pretty sure to be worth the investment that you may have to make.

3. **Plan an absenteeism control program.** Absenteeism is a big and costly problem at any time. But it is always at its worst when labor is scarce.

Countless things can be, and were, done to control the problem under wartime production conditions: Workers were paid in German and Japanese currency (Russian next?) for unexcused absences. Absentees' time cards were conspicuously marked so fellow workers could turn the heat on shirkers. Absentees were required to go through tedious "reporting back" processes. They were visited at home by nurses or delegations of fellow workers. They got telegrams reminding them of the seriousness of absenteeism. And, of course, they were disciplined and discharged.

These are just a few examples of the different methods that were used. Some were good, and some were only fair. The same techniques often produced different results in different plants.

Your own past experience and present knowledge of what will suit local conditions must decide what plan you will use. There is one point that applies pretty generally to all plants: Watch out for plans that rely mainly on force or threat of punishment. Aim for plans that rely on employee participation in absenteeism control. They are the ones that help to improve employee relations and make it easier to keep workers on the job.

4. **Plan to utilize workers better.** This means a lot more attention than many firms usually give to *retraining* and *relocating* workers. Do this when jobs run out or workers don't make out on the first job you assign them to. When labor is scarce it is far easier to salvage a worker already on the payroll than to try to find one outside.

Consider also what you can do to use employees at their highest possible skills. The direct benefit of so doing is a better paid and probably happier individual—one who is less likely to want to leave. The indirect, but very important, benefit is that good use of skills in your plant can be powerful evidence to cite in seeking deferments of key men.

If you have an employee testing program, you can use the test results to help place workers where they can make best use of their skills and aptitudes. If you don't have such facilities, you can get help outside if you want it.

Proper placement of workers is good insurance that they will stay on the job.

5. **Make plans for meeting the special problems of women workers.** You can get clues as to things to do from some of the big reasons why women quit jobs in World War II. For instance:

"Can't take care of children and work." This one has already led one big midwestern employer to set up a child-care center, all ready to go into operation as soon as large-scale hiring of women starts. Smaller firms, of course, can't do anything like that. But there are community facilities in almost all sections of the country that can be adapted—or that already give such services. Check the possibilities of help from church and welfare organizations, whose aid may be enlisted now in the planning stage.

"Work schedules inconvenient." This was a common complaint of married women. They couldn't find time to shop and care for children when required to work 10-hour days or 6-day weeks. Some firms solved the problem with shorter schedules for women —8-hour days, and 5- or 5½-day weeks. But don't overlook possible production complications, and complaints from those women who have no home duties and want longer hours and bigger earnings.

"Work clothes and safety equipment are ugly and uncomfortable." This was probably the biggest headache to men bosses in the 1941-45 period. Women like uniforms to look smart and attractive—a fact that alert employers recognized. The result: many of these employers let the girls tell them what they wanted. Companies that design and sell uniforms and safety apparel profited from these experiences. Most of these firms can now supply you with thoroughly comfortable and good-looking equipment designed for women.

"Jobs are unpleasant." This can mean almost anything. But generally odors, noise, dirt, and heat were the big complaints. They are likely to be overlooked as problems where experienced, shop-wise women workers have been employed. Women who aren't accustomed to shop conditions react very differently and quit in protest.

Most unpleasant jobs don't actually have to be that way at all. Proper exhausting systems will usually take care of odors and heat. Dirt is no big problem if housekeeping is up to reasonable standards. Noise is tougher to beat; but it's worth trying, because even hardened shop workers work more efficiently when noise is controlled.

"Washrooms and restrooms dirty and uncomfortable." To keep women workers happy, this is a must item. It's not so critical for men, but don't underestimate the importance of good facilities for them, too.

"Foremen are sharp and unsympathetic." This is really serious—mostly because foremen who are used to dealing with men don't realize there's anything wrong with using the same approach for women. Where women are not normally employed in large numbers, the best answer is to train foremen in proper ways to deal with women workers.

6. **Work out ways to keep morale high.** This is especially important for newer employees. The big problem is to beat down disinterest and cynicism. In World War II, much effort went into special morale-building programs for this purpose. Mostly they worked well.

Suggestion systems were strengthened. War Production Drive committees were formed. Workers were consulted to get their ideas for improving efficiency, cutting absenteeism, and reducing waste. All kinds of "will to win" programs were conducted, with posters, speakers, contests, committees, and other trimmings.

Consider these and other methods. Which ones are you now using? How will you supplement them? Who will be responsible? How can your union help?

7. **Make plant security rules an asset in your "keep workers" program.** In any defense program, this is a big point. Aim to make it easy for workers to identify themselves and to get in and out of the plant. But don't give the impression of laxity. Evidence that the plant is well protected is reassuring to workers. And good treatment from well-trained guards and firemen will prevent the friction that often leads to disgusted resignations.

Get plant protection men to render services that will help keep workers on the job, too. For instance: Patrol parking lots to spot flat tires, engines running, and other auto troubles; operate emergency service to transport sick or injured workers; safeguard personal property not allowed in the plant; and direct traffic to ease jams and prevent collisions.

All this will make plant security a positive factor in employee relations, instead of a negative one.

8. **Help make it easy for workers to get to the plant.** If you are in the middle of a city, with good transportation right up to the door, this is no problem. But most employers aren't that lucky. Some things to explore and plan for now:

Car pools. They were a great help in World War II, and already are being used again in some plants. But to make them work, you need a system. Who will be responsible? How will cars be registered, and riders and drivers brought together? What rules, if any, do you need to stop drivers from charging riders too much?

Parking facilities. What is your top capacity? Is it enough for peak operation? If not, what can be done to expand *now*? Are you getting workers out fast enough at shift-change times? Can you lay out one-way entrances and exits to prevent jamming when incoming and outgoing shifts converge? What about reserved parking spaces? For all workers? Executives only? And don't forget to plan special treatment for handicapped workers who drive.

Waiting rooms. These are important for those who have to wait in the open for buses and streetcars. What would they cost, and where should they be put up? Can you get transportation companies to do the job for you?

Transportation subsidies. These may be worth while for keeping workers who live in less accessible areas. Are there any firms that you can interest in such plans? How much would they cost?

Tire and gasoline rationing. You will surely be in the middle of both of these if they are controlled. Plan to have some one person responsible. Consider how you will register workers and handle your supporting requests for tires and gas to get them to work. Get ready to go into the tire- and mileage-checking business, too. And figure out how you will handle complaints and appeals. They were headaches last time, and may be again.

9. **Try to improve your recreational program.** The results will be hard to measure. But you can be sure of great pressure to do more about recreation as the labor supply gets tighter. In fact, a lot of the pressure will come from within, as harried operating executives grope for ways to cut labor turnover.

The list of recreational possibilities is almost endless. It ranges from major sports like baseball, basketball, and bowling to clubs, picnics, and parties, to movies, checkers, luncheon shows, and even beauty contests.

What you will do depends on your location, the space you have available, and your operating philosophies. But, if you are concerned about making mistakes, it's wise in the planning stage to err toward too much recreation rather than too little.

10. **Spruce up your safety and health programs.** Study frequency and severity of injuries, and compare with past years. Aim for greater participation of foremen and workers in safety activities. Make safety a big item in planned induction of new workers, too.

Check up on the usefulness of your medical program for preventing illnesses, occupational diseases, and minor injury complications.

Consider how your first aid records can be used to help prevent serious injuries. Are foremen being told about minor accidents that might have been major? Is anybody seeing that they do something about it?

11. **Review eating facilities for workers.** If you are close to outside facilities, are they any good? What can be done to improve them? Discussions with owners any help? Will a small subsidy do the job? If you have no cafeteria, this may be a serious problem. You will certainly want to explore possibilities of vending machines and light snack bars for inside-the-plant feeding.

If you have a cafeteria, is its capacity big enough for peak future needs? If not, what is the best way to supplement it? Will you enlarge the basic facilities, or supplement with vending machines or snack bars?

Study the quantity and quality of your food service critically. Also your price policy. If you're not happy with what you discover, consider the possibility of getting a professional cafeteria management concern to run your service. You may not save money, but chances are good that you will improve food and service. And you will relieve your own staff of one headache so they can concentrate on others.

TIPS TO GOOD HUMAN RELATIONS for factory executives

GRIPE PAGE WITH REAL APPEAL There are ways and ways to run "gripe pages" in an employee magazine. The way it is done by Formfit Company, Chicago, certainly looks like one of the good ways. It results in a lively and constructive two-page spread in every issue of the company's magazine, *Life at Formfit.*

Employees pull no punches in writing in their bouquets and brickbats. Only restriction: no items that would embarrass a co-worker.

Management's answers are refreshingly blunt and pointed. For example:

Complaint: "The group bonus plan on the second floor is outrageous . . ." *Answer:* "That's right, but don't forget that you were earning as high as 24% some time earlier. Obviously something is wrong. That's why engineers have been making new studies."

Complaint: "We should get paid for machine trouble . . ." *Answer:* "Operators *are* paid for machine trouble . . . though the fact isn't as generally known as it should be . . ."

HOW TO CUT FOOD SERVICE WASTE Crosse & Blackwell's London plant has a simple way to cut food waste in the company cafeteria. It works like this: C&B posts luncheon menus in its cafeteria one day ahead. Employees having lunch today, say, are asked to register their choices of what they want for tomorrow's lunch, based on the posted menu. That gives the company a pretty accurate idea of what the next day's orders are going to be like. It's a great help in ordering and conserving food, since it cuts guesswork to a minimum.

MAGAZINE FOR MANAGEMENT "Management Manpower" is the attractive, and accurate, title of a brand-new kind of magazine just started by General Foods Corporation. It's published strictly for the company's management men. The first issue, November, 1950, is a 38-page job, filled with a skillful "mix" of company information, plus articles and facts of broad general interest and value to General Foods management.

"Management Manpower" is a big advance over the news letters that some firms are now using for their executives. It's worth study, particularly where the management force is large or scattered over a broad area.

NEW TWIST ON "BIRTHDAY-HOLIDAYS" Plastic Manufacturing Company, Stamford, Conn., comes up with an interesting new version of the "birthday-holiday" idea for employees. As is usual in such plans, the company grants each worker a personal holiday on his birthday—with pay, of course. The new twist is that if the worker reports for duty on his birthday, he may work the holiday and get double pay.

But that's not all. For another kind of "birthday"—the worker's employment anniversary—the company also gives a present. Each worker gets $10 on his anniversary. *More on next page*

ALL DAY LONG....
still going strong on

EXIDE-IRONCLAD BATTERY POWER

Round-the-clock performance! No mechanical troubles! No unscheduled down time! You get that kind of materials-handling with battery-electric trucks and Exide-Ironclad Batteries. They provide:

- **instant surge of power** to meet all demands in *start-stop, lift-and-shift* manipulations . . . plus finger-tip control for split-second operations, easy maneuvering, accurate spotting.
- **uniform speed throughout shift,** with trucks handling as much tonnage during last hour as during first.
- **exceptionally long life**—proved on more than 100,000 heavy-duty jobs.
- **low operating costs** — batteries are easy to keep charged for they absorb a very high percentage of charging current. Recharging costs as low as 2 cents per K.W.H. of battery capacity.
- **low maintenance costs** — no moving parts to get out of adjustment or break . . . easy to charge, change, add water, keep records of water additions, gravity and voltage . . . seldom costs more than 15 cents per shift to maintain.
- **inherent safety** — battery power provides quiet operation with less worker fatigue; no fire hazard, no contaminating fumes; no vibration to jar work in transit; no oil seepage on floors to create accident hazards.
- **wide range of sizes** for every make of battery-electric truck; compact construction permits standardization.

Combined, these and other Exide-Ironclad characteristics assure you dependable performance, day after day . . . for years.

Exide-Ironclad Batteries are the Best Power Buy... AT ANY PRICE

Write for more facts and FREE copy of Exide-Ironclad Topics. It contains latest developments in materials-handling . . . shows actual case histories.

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1888 . . . DEPENDABLE BATTERIES FOR 63 YEARS . . . 1951

A NEW KIND OF HAPPY NEW YEAR

Thanks to Metropolitan Life Insurance Company, here's a new kind of New Year message you can give workers—one that has real meaning for industry: A 20-year-old man starting work today can look forward to 11½ more years of life than if he had started work 40 years ago. At age 30, the gain is about 10 years; at 40, it's 7 years.

Among the main reasons, says Metropolitan, are these: safer and healthier working conditions, shorter hours of work, improved economic status of workers, and big advances in medical science.

IT PAYS TO GET EMPLOYEES TO HELP

A good example of how you can benefit from enlisting employee cooperation in important problems comes from Thompson Products, Inc., Cleveland. The problem at Tapco is to get good trainees for production work in an area that is already feeling the pinch of manpower shortages. Employees were asked to help by getting friends and relatives to apply. The result, the company reports, is that 60% of new workers hired have come from this source.

In a recent article telling employees what their efforts have accomplished, Tapco reports: "There is no want of applicants, even though the reservoir of available help on record at the Ohio State Employment Office is at the lowest ebb since the war . . ."

The company also reassures workers about the quality of employees hired as a result of their efforts: "The high standards for hiring have not been lowered at any time. Thus the old employees have the assurance that the newcomers will be acceptable and fit readily into the family of workers."

THE RIGHT WAY TO HANDLE BAD NEWS

You discover some condition in your plant—widespread gambling, for example—that is obviously full of public- and community-relations dynamite. What do you do? Ignore it? Hush it up? Wait till someone finds out, and say you didn't know?

Here's what Commander E. F. McDonald, Jr., president of Zenith Radio Corporation, did when faced with exactly this problem. It's a splendid example of constructive action on a touchy problem that helps to earn friends, not lose them. And it's a case worth studying because it could happen to any plant.

Commander McDonald learned from complaints of employees' wives that professional gamblers were preying on many Zenith workers. The gamblers had actually hired some employees as their paid agents.

McDonald immediately started a long and careful investigation, with full cooperation of the union and police officials. When the facts were in, the situation was rapidly cleaned up, and the ringleaders among employees were dismissed.

The company then told the whole story in a frank and detailed news release—a fine way to climax a good job.

WATCH OUT FOR THIS KIND OF WOLF CALL

Hiring of women workers is on the upswing in many parts of the country. But the kind of "wolf call" that may cause you the most trouble is one you're not likely to think of. Here's the problem, in the words of one executive who suffered through it in World War II:

"We got panicky when the volume of women applicants slowed down, so we pulled all the stops in a big publicity and advertising campaign. We were mobbed, and soon ran out of job openings. That meant we had to turn away a lot of good applicants, and they were pretty mad about it. A lot of other firms did the same thing. As a result, we soon found ourselves in the position of the boy who cried wolf. Many women who didn't really have to work just didn't believe us when we hollered we needed women workers.

"I think it would be a good idea to warn your readers about this one. The best advice I can offer from sad experience is this: Don't turn on the flood gates when you need only a trickle. If you do, you'll be sorry later on."

SPEAK UP—DON'T BE BASHFUL

That's good advice if you're running open house programs. Or if you are in the habit of scheduling conducted tours through your plant. Here's how Wincharger Corporation, Sioux City, Iowa, follows this advice. It "spoke up" to good effect during its recent open house by using 16 public address systems in the plant. Recordings one to two minutes long told visitors about the operations in near-by departments. This plan worked well, and saved plenty of wear and tear on speakers' vocal cords.

For conducted tours, Bethlehem Steel speaks up, too. But the method is a little different. Company guides carry portable amplifiers around with them. Even in noisiest spots, visitors can hear every word spoken by the guide and the key men he asks to talk. This isn't unique. But visitors' reactions are so favorable that the idea is worth adopting.

1892 INDUSTRY AND HYATT—PARTNERS IN MECHANICAL PROGRESS **1951**

Hyatt says "Thank you"

Together we've worked through fifty-eight busy and pleasant years—but the last one, thanks to you, was the greatest in Hyatt's history.

Seems as if all Hyatt users moved ahead with the big production parade in agriculture—textiles—petroleum—highways—automotive—railroads—aviation—steel—material handling and numerous other fields.

The resultant increased orders for Hyatt Roller Bearings, we deeply appreciate. And at the same time we are equally happy over the continued and ever-growing preference for Hyatt precision production and outstanding performance.

In anticipation of your future demands for like workmanship and service, we are constantly providing improvements in our product design, application and manufacturing facilities.

So with our fifty-ninth year ahead, we want all of our old friends, and new, to know Hyatt not for our "age" but for our "experience" as . . . the largest manufacturer of straight cylindrical roller bearings in the world.

HYATT BEARINGS DIVISION, GENERAL MOTORS CORPORATION
Harrison, N. J., Chicago, Detroit, Pittsburgh, Oakland, Calif.

HYATT ROLLER BEARINGS

POINTERS FOR FACTORY EXECUTIVES

HOW TO CUT LABOR COST OF PAINTING ZINC-COATED ROOFING

Up to now, wire brushing of rusty galvanized roofing or corrugated siding has been considered necessary to prepare a perfect surface for repainting.

No need for this, says the American Zinc Institute, if you use metallic zinc paint. Long-range tests in normal exposures prove the results are only slightly better, if any, than those obtained with an ordinary stiff-bristled fiber broom. You might as well save the added expense of wire brushing.

Theoretically, you should repaint before actual rusting begins—that's when you see dark areas here and there over the surface. This condition usually develops after your roof has been in service 10 or 12 years.

However, the Institute recommends you wait to repaint until 10% of the surface shows rust. Give the spots of rust a coat first, then paint the entire surface.

For small jobs the Institute suggests hand brushing; it's simpler and quicker. For areas several hundred square feet or over, it says spray painting with an external-mix gun is preferable, although coverage is one-fourth less. Be sure to use enough pressure to give you 75-80 psi. on the paint line when at roof height.

Also, you need 100-120 psi. on the air line for proper atomization. Trigger the gun at the end of each stroke to avoid piling up the paint in uneven laps.

ON AGAIN, OFF AGAIN, EXIT SIGNS ARE RED AGAIN

At least, that's what the American Standards Association's revised code A9.1-1949 says. It's a switch from green, the color formerly designated by the code, as we told you in October.

You're entitled to ask, "Now what's a fellow to do?" So we have checked with several authorities for the lowdown. About 1942 the building exits code, jointly formulated by ASA and National Fire Protection Association, was changed to make green and white the acceptable exit color. This was based on the idea that green meant *go*, and red meant *stop*. The National Safety Council followed suit in its literature, to conform.

However, such a howl went up from all the people who already had red exit signs that the ruling was reversed. NSC will again conform in its next issue of reprints. Here's the way it now seems to stack up:

1. Section 1205 of the latest code reads: "*Except where otherwise required by law or ordinance,* exit signs shall have white letters on a red field, or for internally illuminated types shall have red letters of translucent material in an opaque field."
2. This means, if there are any local ordinances (or failing these, state ordinances), you must follow them.
3. If there are no ordinances, your insurance carrier may insist on red and white, or may allow green and white.
4. In any event, be sure you have exit signs where they ought to be, and see that they comply with whatever regulations govern.

SOME LIKE IT HOT, SOME LIKE IT COLD

Now that the heating season is here again, the plant engineer plays another of his many pacifying roles—i.e., keeping workers comfortable.

It's impossible to maintain a room temperature that will please everybody. So, cater to the majority, is the first rule.

But don't ignore the minority—it may have a valid gripe, too, that can be easily eliminated. Complaints about drafts, cold spots, or warm spots are not hard to handle. It takes only a thermometer (recording, if possible) or a smoke test to justify the need for action. Sometimes you have to suggest red flannels to the sheer-clad worker.

It's the guy or gal who roasts or freezes without provocation that is the toughest problem. They drive plant engineers crazy. But one plant we know

They Save $358.54 a Month by not Pulling this Switch

Every day the machinery in a Clinton, Mass. plant* had to be stopped for a half hour while those machines were lubricated. Every stop meant lost production time plus a $14 expenditure for lubrication.

The Clinton people called in an Alemite Lubrication Engineer. They wanted to know if they could eliminate the costly interruption in production time. They felt that lubrication was costing them too much.

The Alemite Lubrication Engineer studied their problem and recommended a system that automatically lubricates the machinery without any shut-down. What's more, lubrication cost was cut from $14 a day to only 21c a day. That saving alone paid for the entire investment in just 43 days.

Call Your Alemite Lubrication Engineer

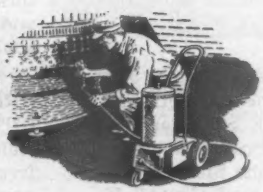
No matter what size or type of plant you operate, Alemite can show you dozens of ways to save through the more efficient handling of petroleum products. Call your local Alemite Industrial Distributor now or send for the free booklet "11 Ways to Cut Production Costs." Simply attach the coupon below to your letterhead. Dept. C-11, 1850 Diversey Parkway, Chicago 14, Ill.

*Name on request.

Alemite Cuts Costs 3 Ways

1. In transferring lubricants... cuts man hours 63% for every 100 pounds transferred. No mess, no contamination.

2. In loading grease guns... saves 3¾ man hours for every 100 pounds of lubricant loaded into hand guns.



3. In applying lubricants... saves up to 23.9 man hours for every 100 pounds of lubricant applied to bearings.

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Another Product of Stewart-Warner

FREE! Valuable booklet—
"11 Ways to Cut Production Cost"
(Simply attach to your letterhead)
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1850 Diversey Parkway, Chicago 14, Ill.

We'll include facts on the new Alemite Oil-Mist System, too—(OIL-MIST atomizes oil into mist, circulates it to bearings under pressure. Increases life of bearings as much as 17½ times).

Name .....

Company .....

City ..... State .....

MAINTENANCE POINTERS

Begins on page 138

of found a cure for these irreconcilables. It simply decided they were psychological and not physiological problems.

So every time Frigid Florence sets up a squawk, the area mechanic hops up the ladder, turns a valve or two, or changes the thermostatic control setting with a screwdriver. At least, that's what Mamie and everyone else think—in reality no *change* is made at all. But Florence settles down contentedly for the rest of the day. She's had her way.

CRANE SEATS SPEED LIGHTING MAINTENANCE

Removable seats suspended from an ordinary floor-operated bridge crane are simplifying the cleaning of fluorescent fixtures at Warner & Swasey Company, Cleveland.

There's a seat hung from each end of the bridge, directly under a line of lighting fixtures. One man works on each of these seats. A third man at floor level handles materials to and from the men on the seats—old and new lamps, pails of cleaning solution, or any special needs.

The control box is placed on one of the seats, so one man is able to control crane movement.

FIRE PREVENTION BOOKLETS FOR YOUR LIBRARY

The author is Factory Insurance Association, 555 Asylum St., Hartford 2, Conn. The booklets are "Recommended Good Practice for Safeguarding Flammable Liquids, Storage, and Processing" and "Recommended Good Practice for the Storage and Handling of Liquefied Petroleum Fuel Gases." If these are not your problems now, it may be that they will be soon.

GOOD WAYS TO SOLVE SPECIAL PLANT ENGINEERING PROBLEMS

WHAT SIZE VENTILATING DUCTS TO INSTALL: Ordinarily, this is quite a complicated problem. It involves progressive factors—quantity of air (cfm.), optimum velocity, friction loss, first cost, operating cost. Trane Co., La Crosse, Wis., saves you a lot of chart work and cross-checking with its multiple-scaled circular slide rule; cost, $1.

WHEN METAL ROOF GIRDERS ARE HARD TO GET: Perhaps timber roof trusses will do. Timber Engineering Co., Washington 6, D. C., offers to show you how in its free booklets, "Timber for Industrial Buildings" and "Wood Frame Teco Trussed Rafters."

WHAT TYPE FIRE EXTINGUISHER DO I USE? You don't search for the answer when you know "The Fundamentals of Fire Extinguishment." Ansul Chemical Co., Marinette, Wis., has issued a pamphlet by that name for training its own salesmen. It's yours for the asking.

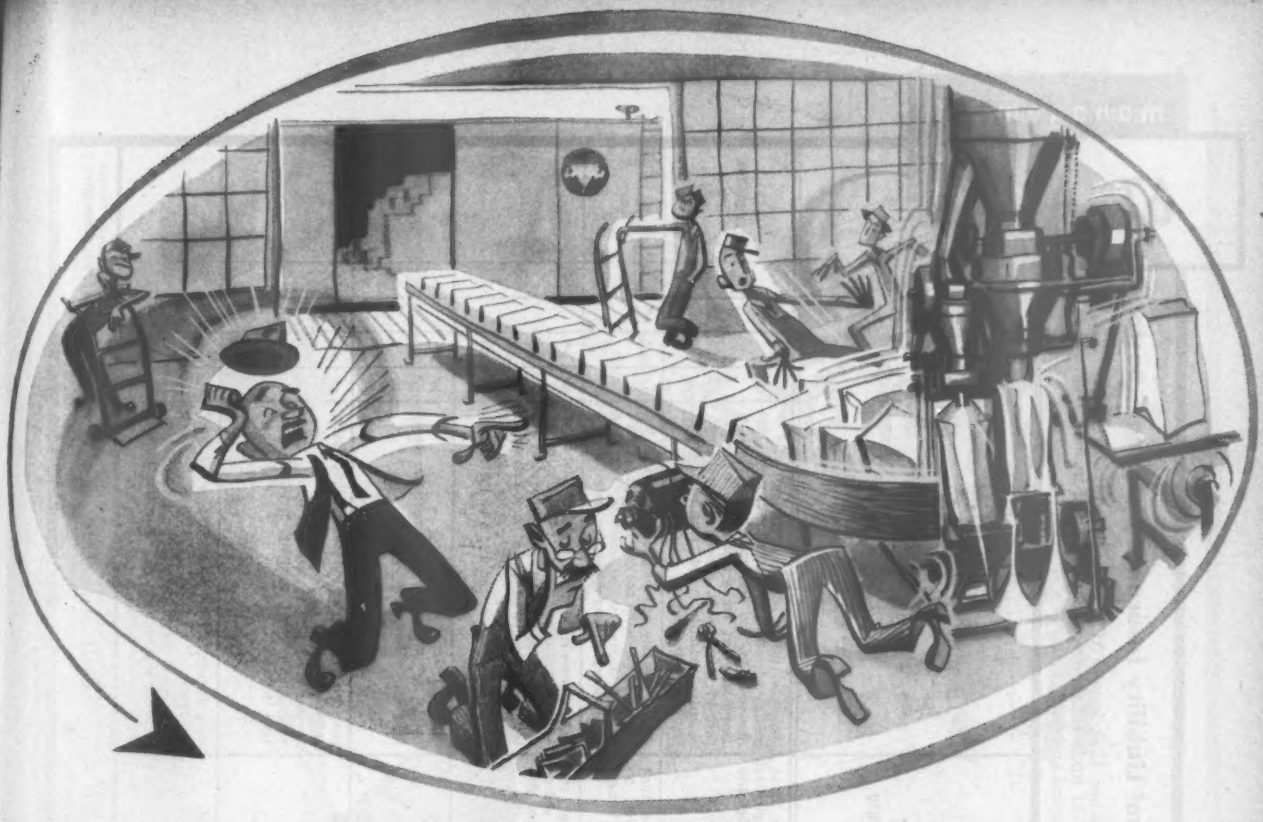
WANT A FLOOR THAT IMPROVES WITH WEAR? This is one of the claims of Walter Maguire Co., 60 E. 42nd St., New York 17, for its Emeri-Crete flooring. It's made from an aggregate of emery to which you add only cement and water. Write for Bulletin 606, which gives full details of applications and service.

SO YOU CAN'T GET STEEL PLATE FURNACE ENCLOSURES! You don't need to, says Bigelow-Liptak Corp., Detroit 2, if you use its Texad resin-coated canvas covering. It's designed for use on boilers and industrial furnaces. You get air-tightness and a weatherproof finish at lower cost.

WHAT OILS FOR HIGH-TEMPERATURE LUBRICATION? When E. F. Houghton & Co., Philadelphia 33, asked itself this question, it took an 18-months' research program to find the answers. Houghton says its folder on "Hi-Temp Oils" now takes the guesswork out of choosing dependable hot-spot lubes.

HOW TO DESIGN AND INSTALL SHORT CENTER DRIVES: This is the title of a 23-page booklet showing the use of the Tannate-Rockwood drive. Suitable for economical driving of compressors, pumps, blowers, exhausters, machine tools, and line shafting. Write J. E. Rhoads & Sons, Philadelphia 6.

ARE ANY OF YOUR HYDRAULIC SYSTEMS CUTTING UP? Maybe they're not getting the right care. Sun Oil Co., Philadelphia 3, offers a free 18-page booklet crammed with good maintenance tips on care of oil, and on how to clean systems, test oil, and drain it. Includes 10 pages of complete trouble-shooting charts.



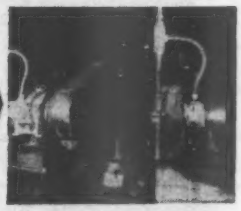
Burned-out Motors Waste Manpower!

Maximum productivity has been forced upon us by considerations far more compelling than cost accounting. Critical motors will have to work 24 hours a day, month after month for more years than we dare to imagine. Money can no longer measure the cost of wasted manpower or lost production. Motor failure is a luxury we can no longer afford.

Under such conditions a more extensive use of Silicone (Class H) Insulation becomes imperative. It's an established fact that Class H insulation made with Dow Corning Silicones will increase the life and the wet insulation resistance of electric machines by a factor of 10. In motors driving conveyors, cranes, lift trucks or diesel-electric locomotives; in transformers or solenoids; wherever electric equipment must work under tough operating conditions, you need the added life and overload capacity of Silicone insulation.

Most of the best rewind shops stand ready to rebuild your hardest working motors with this longer lasting, more reliable class of insulation. Many motor manufacturers are now willing to take orders for new Class H machines.

In Critical Motors which determine your productive capacity . . .



In Overloaded Motors whether the load is intermittent or sustained to meet increased production schedules . . .

In Motors Exposed to High Ambient Temperatures or Excessive Moisture—Specify Dow Corning Silicone Insulation.

Dow Corning Silicones Mean Business!
MAIL THIS COUPON TODAY

DOW CORNING CORPORATION, MIDLAND, MICHIGAN
Please send me technical data and a list of rewind shops experienced in the use of Dow Corning Silicone (Class H) Insulation L-1

Name_____

Company_____

Street_____

City_____ Zone_____ State_____

Dow Corning
FIRST IN SILICONES

DOW CORNING CORPORATION BRANCH OFFICES: ATLANTA • CHICAGO • CLEVELAND • DALLAS • LOS ANGELES • NEW YORK • WASHINGTON, D. C.
In CANADA: Fiberglas Canada Ltd., Toronto • In GREAT BRITAIN: Midland Silicones Ltd., London

TOXIC SUBSTANCES

Their Properties, Effects, and Controls

Source: **American Mutual Liability Insurance Company, Boston**

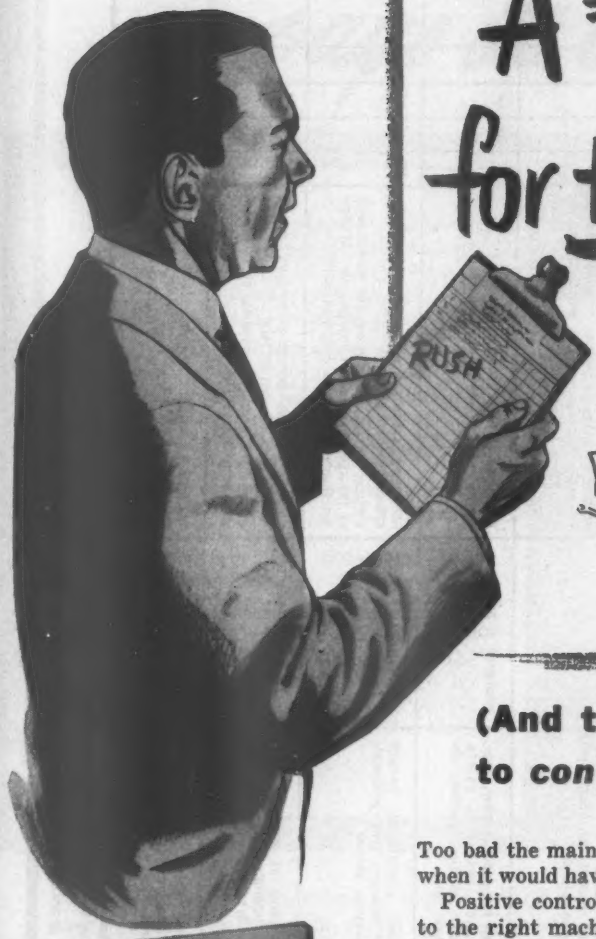
IN THE December, 1950, issue FACTORY printed the first part of the list of 31 toxic substances commonly used in industry. This is the second and final part.

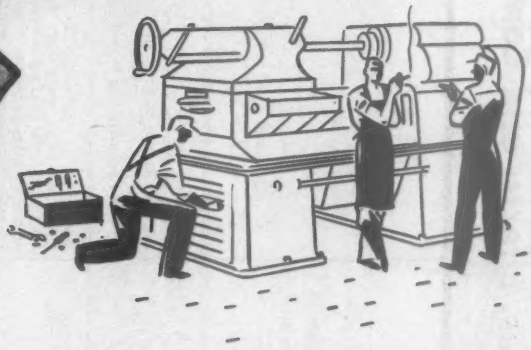
TOXIC SUBSTANCE	ORDINARY STATE	FIRE HAZARD: EXPLOSIVE LIMITS 100% BY VOLUME IN AIR — LOWER	FIRE HAZARD: EXPLOSIVE LIMITS 100% BY VOLUME IN AIR — UPPER	FIRE HAZARD: SUSCEPTIBILITY TO SPONTANEOUS HEATING	FIRE HAZARD: EXTINGUISHING AGENT*	PROBABLE SAFE CONCENTRATION	PRINCIPAL USES AND PROCESSES PRODUCING POTENTIAL HAZARD	MODE OF ENTRANCE INTO BODY	DIAGNOSTIC SIGNS AND SYMPTOMS	CONTROL: MFG. IN CLOSED SYSTEM	CONTROL: VENTILATION	CONTROL: MEDICAL CONTROLS	CONTROL: BODY PROTECTION	CONTROL: EMERGENCY PROTECTION
Lead	Metal	1.8			1,2,3	0.15 mg./cu. m.	Chemical apparatus; storage batteries; lead pigments; solder; alloys; mining, smelting, reclaiming	As fumes or dust through the respiratory organs and digestive tract	Weakness, pallor, headache, metallic taste in mouth and fetid breath, lack of appetite, lead line on gums, and presence of lead in urine. These symptoms are associated with anemia, gastritis, constipation, loosening of teeth, nervousness, reduction in red blood cells. Abdominal cramps and colic.		✓	✓		
Mercury	Liquid metallic element					.1-.2 mg./cu. m.	Mercury salts; thermometers; mercury vapor lamps, chemical processes, mercury amalgams	As vapor and dust through respiratory organs; as solid through the skin	Chronic mercury poisoning usually affects the mucosa of the mouth and nervous system, which includes restlessness, irritableness, fear, lack of concentration, and depressive states.	✓	✓	✓		
Nitric acid** Nitrous fumes	Liquid Gas					10-40 p.p.m.	Manufacture of explosives and nitrocellulose in photo engraving, metal etching, pickling, welding	As vapor through respiratory system and direct action on the skin	Symptoms usually delayed. Acute nonfatal cases—headache, dizziness, cough, palpitation of the heart and sometimes cyanosis; restlessness and inability to sleep are common. Chronic exposure leads to headaches, sleeplessness, loss of weight, constipation, and ulcers of the mucous membrane.	✓	✓		✓	✓
Ozone	Gas					Less than 0.5 p.p.m.	Produced from air by electric discharge by intense ultraviolet radiation, and by welding Oxidizing agent; bleaching waxes, oils, textiles	Inhalation of gas	Lung irritation. Irritant to all mucous membranes, may cause pulmonary edema; serious, fatal.	✓	✓			
Phosgene	Gas					1.0 p.p.m.	Organic synthesis; metallurgy; has been used as poison gas in warfare; product of combustion of volatile chlorine compounds Bleaching sand for glass manufacture; chlorinating agent	Inhalation of gas	Lung damage; irritates and inflames lung tissue; serious, fatal. Dryness or burning sensation in throat, numbness, pain in chest, vomiting, bronchitis, possible dyspnea.	✓	✓			✓
Silica	Solid					5 million particles per cu. ft.	Abrasives, refractories, metallurgy, foundries, chemical industries, ceramics, insulation	Inhalation of dust	Lung damage; chronic fibrotic disease of lungs (silicosis). Shortness of breath, decreased chest expansion, lessened capacity for work, increased susceptibility to tuberculosis.		✓	✓		

NOTE: See next page for references and code explanations.

**NOTE: Strong nitric acid may cause spontaneous ignition when in contact with organic materials such as sawdust, excelsior, paper, and cotton waste. Nitrous fumes are oxide and nitrogen peroxide will support combustion. noncombustible. However, nitrous

A #&$! of a time for this to happen!





(And time to look for a better way to *control* preventive maintenance)

Too bad the maintenance men didn't get to this machine a few days sooner, when it would have been easy to *prevent* the breakdown.

Positive control of preventive maintenance—insuring the right servicing to the right machine at the right time—is simple when you have a Kardex *Visible* System. Experience and performance are combined to set up a pre-arranged, tested inspection schedule. Kardex colored signals indicate—*automatically*—those items due for inspection. A "Floating Inspector's" record is withdrawn from the Kardex pocket, filled out with specific instruction for the check-up to be performed, and routed to your maintenance men as a work order and report sheet.

When the maintenance job is done, the maintenance man checks off what he did and the card is returned to its place, *automatically* signaling job completion. Then, the Kardex signals are advanced to the next date specified. Details are posted on the maintenance card from the job card, providing a continuing, *permanent* record of maintenance activity.

The quick results: needless, costly "down-time" is eliminated. Operating efficiency goes up. Manufacturing costs go down. All are accomplished with *less* clerical help and a minimum of time-wasting paperwork, thanks to the "floating" maintenance order!

Send today for free folder, *Simplified Preventive Maintenance Control.* It shows how to get maximum maintenance economy . . . how to hold inventories at a safe, healthy level with Kardex *simplified* Property Records.

FREE

Phone us locally or write today for illustrated booklet (KD-449): Management Controls Reference Library, Room 1612, 315 Fourth Ave., New York 10, N. Y.

Remington Rand Inc.
THE FIRST NAME IN BUSINESS SYSTEMS

TOXIC SUBSTANCES – Their Properties, Effects, and Controls

TOXIC SUBSTANCE	ORDINARY STATE	FIRE HAZARD: EXPLOSIVE LIMITS 100% BY VOLUME IN AIR – LOWER	FIRE HAZARD: EXPLOSIVE LIMITS 100% BY VOLUME IN AIR – UPPER	FIRE HAZARD: SUSCEPTIBILITY TO SPONTANEOUS HEATING	FIRE HAZARD: EXTINGUISHING AGENT*	PROBABLE SAFE CONCENTRATION	PRINCIPAL USES AND PROCESSES PRODUCING POTENTIAL HAZARD	MODE OF ENTRANCE INTO BODY	DIAGNOSTIC SIGNS AND SYMPTOMS	CONTROL: MFG. IN CLOSED SYSTEM	CONTROL: VENTILATION	CONTROL: MEDICAL CONTROLS	CONTROL: BODY PROTECTION	CONTROL: EMERGENCY PROTECTION
Sulfuric acid	Liquid	NOTE: May cause ignition by contact with combustible materials.				1 p.p.m.	Chemical mfg.; fertilizers; petroleum refining; explosives; leather industry; electroplating; metal cleaning; photographic processes; rubber reclaiming	Inhalation of mist; skin irritant	Irritant and corrosive to all mucous surfaces, causing inflammation to upper respiratory tract and possible lung damage; attacks enamel of teeth. Extreme corrosive action on skin.	✓	✓		✓	✓
Sulphur dioxide	Gas					10 p.p.m.	Small-home refrigeration units; in occupations of smelters, foundry workers, bleachers, cellulose workers, dyemakers, petroleum refiners	As a gas through the respiratory organs	Irritation and inflammation to eyes, nose, throat, and lungs; occasionally digestive disorders, extremely irritating to eyes and throat, so that individual withdraws from exposed atmosphere. Chronic exposure produces catarrh, disturbance of sense of smell or taste, lassitude, and fatigue.	✓	✓			
Talc	Solid					15 million particles per cu. ft.	Filler for paper, rubber, soap, plastics, cosmetics, paints, plaster; filtering medium; absorbent, etc.	Inhalation of dust	Pulmonary fibrosis (pneumoconiosis). Dyspnea, cough, chest pain, weakness.		✓	✓		
Toluol (toluene)	Liquid	1.27	7.0	NO	2, 3	200 p.p.m.	Organic preparations; benzoic acid, lacquers; dyes; perfumes; explosives; solvent	Inhalation of vapor	Anesthesia, slight blood changes; narcotic effect; usually transitory. Fatigue, weakness, confusion, and paresthesias of the skin; gastric disturbance, users of alcohol specially sensitive, slight dermatitis.	✓	✓	✓		
Trichloro-ethylene	Liquid					200 p.p.m.	Degreasing of metal objects; dry cleaning; solvent for rubber, dyes, oils, fats, waxes, tar, resins, etc.	Inhalation of vapor	Narcosis, possible damage to nervous system; usually transient; can be fatal. Irritation of mucous membranes, dizziness, severe headache, fatigue.	✓	✓	✓		✓
Xylol (xylene)	Liquid	1.0	5.3	NO	2, 3	200 p.p.m.	Organic preparations; solvent for lacquers, varnishes, rubber cement	Inhalation of vapor	Anesthesia, irritation, slight blood changes; narcotic effect; usually transitory; fatigue, weakness, confusion, and paresthesias of the skin.	✓	✓			

*CODE NUMBERS:
1. Water – For most flammable liquid fires on which water may be used, water from a spray or fog nozzle is more effective than a hose stream.
2. Foam.
3. Carbon dioxide or dry chemical.
4. Carbon dioxide, dry chemical, and water spray. With gas fires, the best procedure is to use water to keep the surroundings cool until the leak can be shut off.
5. Approved dry compound for metal fires.

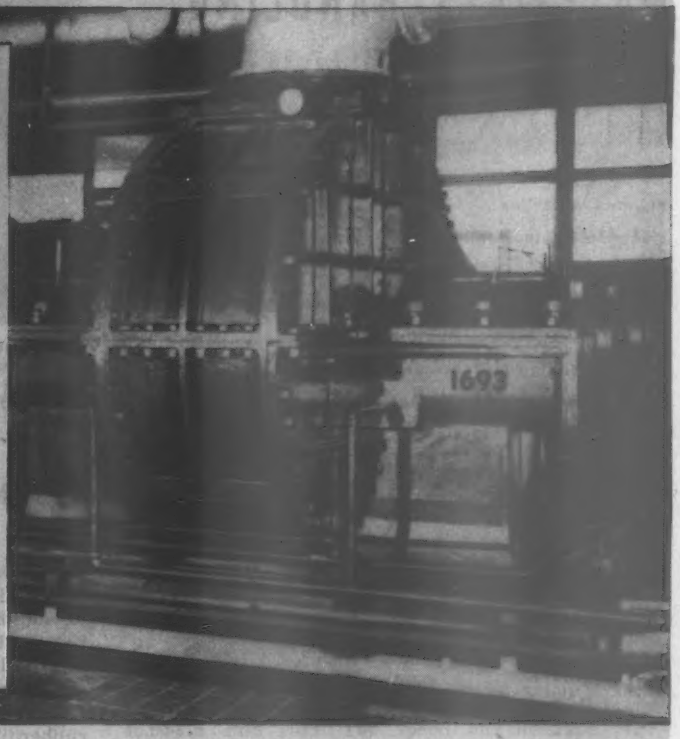
NEW R·C EXHAUSTER

pays its own way

By replacing a 30-year-old battery of three steam-driven gas exhausters with a new, high-capacity, electrically-driven R-C unit, important advantages were gained, in a large industrial plant:

1. **The one new unit carries the base load.**
2. **Steam needed for 5 other steam-driven exhausters, carrying partial load, is substantially reduced because of slower speeds.**
3. **Heat balance in the plant is maintained.**
4. **Savings in total power cost will pay for the new installation in about one year.**

These very satisfactory results were obtained by careful evaluation of all the factors before deciding upon the type of equipment . . . and then by specifying an R-C Rotary Positive Gas Exhauster that will do the work at low operating cost.



Type RCGH Rotary Positive Gas Exhauster, driven by 450-hp synchronous motor. Capacity, 20,600 cfm.

Even though your equipment to handle gas or air may still have years of life, it may be sound economy to replace it with modern, efficient, R-C units of the right type, size and drives to best meet your needs. Our engineers will help you analyze your problem and make unbiased recommendations of either Rotary Positive or Centrifugal equipment, depending upon your specific conditions. This *dual choice* is an exclusive R-C advantage.

With capacities from 5 cfm to 100,000 cfm, R-C units can be closely matched to work requirements, for dependable, economical performance. At Roots-Connersville, almost a century of blower building experience is at your service, without obligation.

ROOTS-CONNERSVILLE BLOWER CORPORATION
151 Central Avenue, Connersville, Indiana

Single-stage, Type OIB Centrifugal Blower in food processing plant. Steam turbine drive; capacity 12,000 cfm.

ROOTS-CONNERSVILLE

BLOWER BUILDERS SINCE 1854

ONE OF THE DRESSER INDUSTRIES

WHAT'S NEW IN EQUIPMENT

BRIEFED HERE — FOR THE CONVENIENCE

IN THIS ISSUE

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IN THE NEXT ISSUE

- Some notes on important late items. More information on them next month.

Selective Storage System—called Stak-Rak, needs only one-man pushbutton control for speedy storage or delivery of pallet loads or bulk items. Fork lift mounted on an overhead crane delivers loads to and from self-standing rack columns.

Chicago Tramrail Corp., 4000 W. Washington Blvd., Chicago 24.

Spray Guns—equipped with the Mogul-Type Powerflo Pump can't possibly spurt, maker says. Pump assures an even flow, eliminates messy blobs.

Gray Co., Inc., Industrial Div., Graco Square, Minneapolis 13.

Pressurized Fire Extinguisher—handles hazardous metal fires. Extinguishing agent forms air-excluding crust over burning magnesium, powdered aluminum, sodium, etc.

Ansul Chemical Co., Marinette, Wis.

Self-Sealing Tank Stud—simplifies fastening to liquid containers. Stud has pipe thread on one end, standard screw thread on the other.

Donear Products Co., 1523 Huffman Blvd., Rockford, Ill.

Hard Chrome Plating Process—will add life to wear parts and cutting tools. Parts can be plated in compact bath to within tolerances of 0.0001 inch.

Ward Leonard Electric Co., Industrial Chrome Div., Mount Vernon, N. Y.

1 ASSIGNED TO SPOT a gondola car, Trackmobile takes the shortest path across the yard to the track. The midget locomotive has a top speed of 20 mph. on its road wheels.

Baby Locomotive

YOU JUST CAN'T keep the Whiting Trackmobile down —on the tracks, that is. Not that you would want to, for one of the highlights of this midget locomotive is its ability to hop on and off railroad tracks at the drop of its wheels.

Trackmobile has two sets of wheels—four standard railway wheels for track travel and four small rubber-tired wheels for speeding from one track to another around the factory or railroad yard.

To get on the tracks, the operator drives Track-

Pallet Elevator

The Barrett fork-type portable elevator tiers single faced pallet loads. The double-decking elevator has an overall height of 6½ ft., a lifting height of 4½ ft. The triple-decking unit is built to any height required, with a hinged top that collapses for travel under overhead obstructions.

These manually-pushed elevators come with either hand- or electric-operated hoist in 2000, 3000, 4000, 5000-lb. capacities. Manual model has two-speed lift and governor control. Electric type has cable control, electric solenoid brake, and 25 feet of electric cable.

Barrett-Cravens Co., 4609 S. Western Blvd., Chicago 9, Ill.

2 OVER THE TRACK, tires come up, railway wheels come down. Now connected to the load, Trackmobile jacks up the gondola coupling (circle)—borrowing some of the car's weight to increase its own traction.

3 UNDER WAY, the 3-ton locomotive handles its 25-ton load with ease. When this job is done, Trackmobile will let down its road wheels again and take off across the yard in search of more work.

—at Home on Road or Rail

mobile across the rails and hydraulically raises its road wheels, lowering the track wheels into place. To hop off again, the operation is reversed. The Whiting people say the switchover can be made in 30 seconds.

The 3-ton locomotive provides a versatile unit for hauling, spotting, and switching freight cars in plant yards and spur lines. Though it weighs only 6000 lb., Whiting claims it can move more than 150 times its own weight. It does this by borrowing some of the weight of its freight load to increase the traction of its own wheels. A self-contained hydraulic ram jacks up against the freight car to which it is coupled, in effect forcing Trackmobile down on the tracks. The added traction gives the locomotive its rated drawbar pull of 7350 lb. In actual demonstrations, its 60-hp. engine has easily handled three 45,900-lb. box cars. Top speed on the rails is 9 mph., on the road 20 mph.

Whiting Corp., Harvey, Ill.

Packaged Trolley Conveyor

You can put together and take apart the Champion overhead trolley conveyor pretty much like an Erector set. Standard channel sections are fitted together to desired layout. One fractional horsepower motor drives several hundred feet of continuous belt. Designed to move relatively light parts, Champion has a capacity of 25 lb. per foot, 3 hangers per foot.

Conveyor weighs only 3 lb. per foot, requires no superstructure other than simple rod hangers. Packaged sections can also be adapted to bench and portable conveyor systems.

Lightweight Conveyor Co., 18690 Lauder Ave., Detroit 35.

Portable Belt Conveyor

This Model 100-U belt conveyor, five feet in length, will fit in your plant where use of a smaller conveyor unit is considered more practical. The 8-in. neoprene-impregnated belt has flights 1⅜-in. in height spaced on 18-in. centers. Belt without flights is optional. Takeup mechanism is provided for ample belt adjustment. Pulleys have permanently lubricated sealed ball bearings.

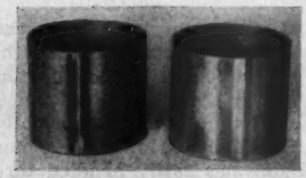
A 1/12-hp. motor mounted inside the conveyor channel drives the belt at 125 fpm. Side rails, the full length of the conveyor, can be removed for handling cartons or bulky materials.

Industrial Engineering & Mfg. Co., Brimfield, Ind.

More on next page

SINGLE GRINDING PASS gives smooth finish to shells of vertical electric motors.

800% faster weld removal with 3M Abrasive Belts!



LOOK AT THESE RESULTS

When Century Electric Company, Saint Louis, Missouri, installed the modern 3M Grinding Method, production of stator shells jumped from 15 to 125 pieces per hour. New backstand equipment and fast-cutting 3M Abrasive Belts eliminated one entire operation. Plus value: a smoother, more attractive finish on each seam.

Converting your present grinding and polishing equipment to this new system is easily done—and at a minimum cost. The 3M Representative in your locality will be glad to check your present finishing operations—point out ways to increase your production, cut your unit costs. Use the coupon below for free help on your grinding problems.

Minnesota Mining & Mfg. Co. F 151
Saint Paul 6, Minn.

Please send copy of
"Step Up Production" Booklet.

3M ABRASIVE BELTS

NAME_____

FIRM_____

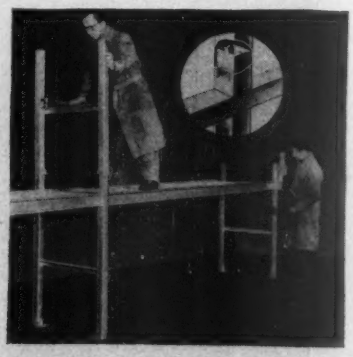
ADDRESS_____

CITY_____ ZONE_____ STATE_____

Made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn., also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Adhesives.
General Export: Durex Abrasives Corp., New Rochelle, N.Y.
In Canada: Canadian Durex Abrasives Ltd., Brantford, Ontario.

MATERIALS HANDLING EQUIPMENT

Begins on page 146



Pallet Shelves

Bolting or welding isn't necessary in piecing together this pallet shelving. All you need is a hammer to join prefabricated steel sections together to desired height.

Tubular uprights slip over special C-channels on the end of each pallet bed. Indentations in the legs of the uprights press the channels of adjacent beds together, forming a rigidly locked assembly. There are five standard rack sizes, as well as various types of channels and tubes to meet different load conditions. Sheet steel, plywood, and board decks are available.

American Sales Engineers, Dept. 24, 141 W. Eight Mile, Detroit 3.

Integral Steel Bucket and Chain Link

Cast as one piece with a single link of chain, these heat-treated steel Uni-Cast buckets cannot loosen or fall off. At the same time they are as easily replaced as a single link of chain.

There are no raised surfaces or projecting bolt heads on the inside of the bucket to retard dis-

Everyday Shop Jobs Done Better With DIAMOND Roller Chains

Agitator Drives in Can Company

A Diamond single-strand Chain drives agitator shaft from a 3 h.p. motor Shown with enclosing case removed.

For Power Transfer and Conveyor Flight

Diamond Roller Chain with attachments carry conveyor slats between.

Double Reduction Application

Quadruple Diamond from motor and single from jackshaft to mixer provide simple, double reduction unit.

A Simple Drive in Distillery

Here's a plant-executed Diamond application using single strand chain from jackshaft.

Catalog 709 has 48 pages of data useful to plant men—a copy is yours for the asking.

● In your shop there are many everyday jobs where power transfer is required, from motors or engines to main shafts, shafts to shafts,—for conveyor operation and miscellaneous purposes.

Diamond Roller Chains, in single and multiple strands, in pitches from ¼ in. to 2½ in., offer wide choice for the majority of plant jobs. They meet speed requirements, don't slip or creep, have high efficiency of 98-99%, and because of uniform high quality, reliably insure long-life high-output performance with little or no maintenance or replacement trouble.

DIAMOND CHAIN COMPANY, Inc.

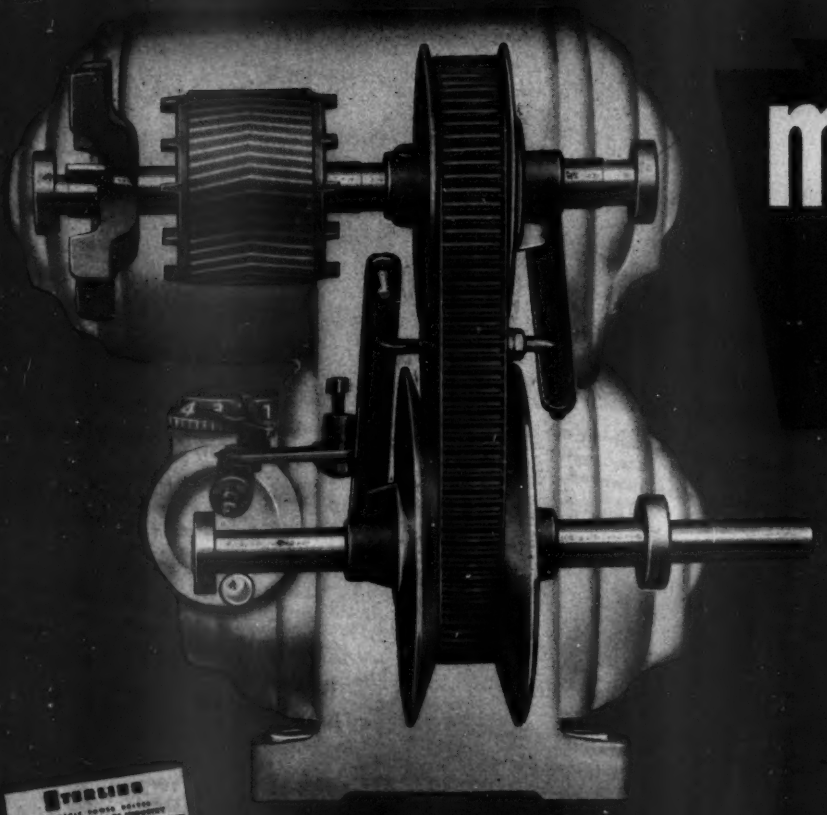
Dept. 449, 402 Kentucky Avenue, Indianapolis 7, Indiana

Offices and Distributors in All Principal Cities

Refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER

DIAMOND **ROLLER CHAINS**

power modernization



means

perfect speed control

Ask for your copy of pictorial bulletin No. B-58, showing Sterling Electric Power Drives Turning The Wheels of Industry.

STERLING SPEED-TROL

...GIVES YOU VARIABLE SPEED CONTROL NECESSARY FOR:

PROCESS CONTROL OF: Temperature — viscosity — level — pressure — flow — etc.

TIME CONTROL OF: Baking — drying — heating — cooking — pasteurizing — soaking — chemical action — etc.

EQUIPMENT ADAPTATION TO: Load variation — sequence synchronization. Size — tension — hardness or shape of materials to be processed — machined — conveyed — blended — mixed — etc.

VARIATIONS IN: Quality — quantity — operators' abilities — etc.

OUTSTANDING FEATURES:

Infinite speeds — positive speed regulation — fingertip control — large indicator — positive pulleys — no springs — protected — balanced design — streamlined — Herringbone Rotor — through ventilation — shielded ball bearings — versatile mounting — NEMA dimensions — shock absorbing — quiet operation — rugged — compact — dependable — long life.

STERLING ELECTRIC MOTORS

Plants: New York 51, N. Y.; Los Angeles 22, California; Hamilton, Canada; Santiago, Chile.

Offices and distributors in all principal cities.

charge of material. Five standard sizes range from 8x5 to 16x8 inches. Other sizes can be made to specifications.

Beaumont Birch Co., 1505 Race St., Philadelphia 2, Pa.

Order Assembly Truck

The Rol-Away Stock Picker facilitates the assembly and transport of small parts and packaged goods. The unit has three shelves, with a stepladder on one end. Operator is given access to stock shelves up to 10 feet from the floor.

The spring-loaded ladder—normally clear of the ground—sinks to the floor under the operator's weight, providing a safe, sturdy base for reaching the upper shelves. Wide handles double as leg braces for the operator in climbing. The aluminum-alloy truck weighs 50 pounds.

Rol-Away Truck Co., 6143 S. E. Foster, Portland, Ore.

Telescoping Lift Truck

Stand-up-drive fork lift trucks of 3000-, 4000-, and 6000-lb. capacity make up the Type FC Center-Control line. Battery-operated units telescope to a height of 126 inches. Features include rubber tires, steering knob for sharp turning and backing into position, one

VARIMATIC DRILL
HAMILTON TAPPER
SMALL HOLES
(.004"—3/16")
PRECISION HOLES
(Straight & Round)
Fast
SMOOTH HOLES
THREADED HOLES
"AS SPECIFIED"
At spots where small, precision holes must be produced on fast production schedules, and where no excuse for failure to produce "as specified" is good enough, the Hamilton line of small hole, super-sensitive drills and tappers enjoy the full confidence of the men who are charged with responsibility for getting the job done.
Year after year, 80% of the sales of these machines are to those who know them through use.
For complete specifications, write for illustrated literature, today.
THE Hamilton TOOL COMPANY
906 HANOVER STREET • HAMILTON • OHIO • U • S • A

Hey Boss!

Here's that NEW

DUFF-NORTON "Shorty" JACK

... and it's a Honey!

"It's only 7" high and weighs only 22 lbs."

IT WILL PAY TO HAVE SEVERAL AROUND THE PLANT

Yes Boss, you should have one or more Duff-Norton "Shorty" Jacks in every department of your plant. Its low height of only seven inches and light weight make it the most versatile jack in our complete line. It can be spotted under equipment too low for other jacks. It will raise 15 tons 2½ inches with ease. Specify Duff-Norton "Shorty" on your next jack order. You'll want more of them when you see its outstanding performance.

"It'll lift anything with ease and safety."

Write today for Bulletin AD-12-K

DUFF-NORTON JACKS ESTABLISHED 1883

THE DUFF-NORTON MANUFACTURING CO.

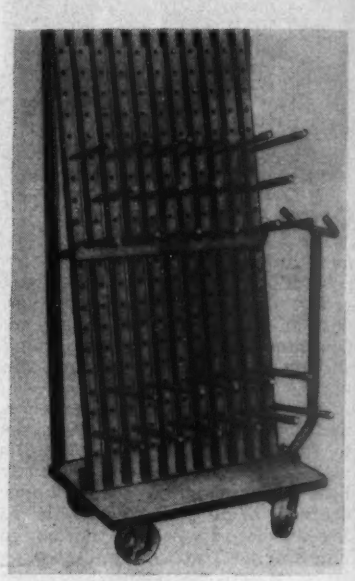
MAIN PLANT and GENERAL OFFICES, PITTSBURGH 30, PA.—CANADIAN PLANT, TORONTO 6, ONT.

"The House that Jacks Built"

pedal control of power and braking, and ready accessibility of hydraulic and electric controls for ease in maintenance.

Spark-enclosed construction is optional for safe intermittent operation in explosive atmospheres. Maker will supply complete details on request.

Baker Industrial Truck Div., The Baker-Raulang Co., 1250 W. 80 St., Cleveland 2, Ohio.



Adjustable Peg Rack Conveyor

This peg rack conveyor is a versatile truck for bringing the machine operator his work properly positioned for fast handling. The adjustable pegs accommodate odd-shaped parts and castings that will not stack.

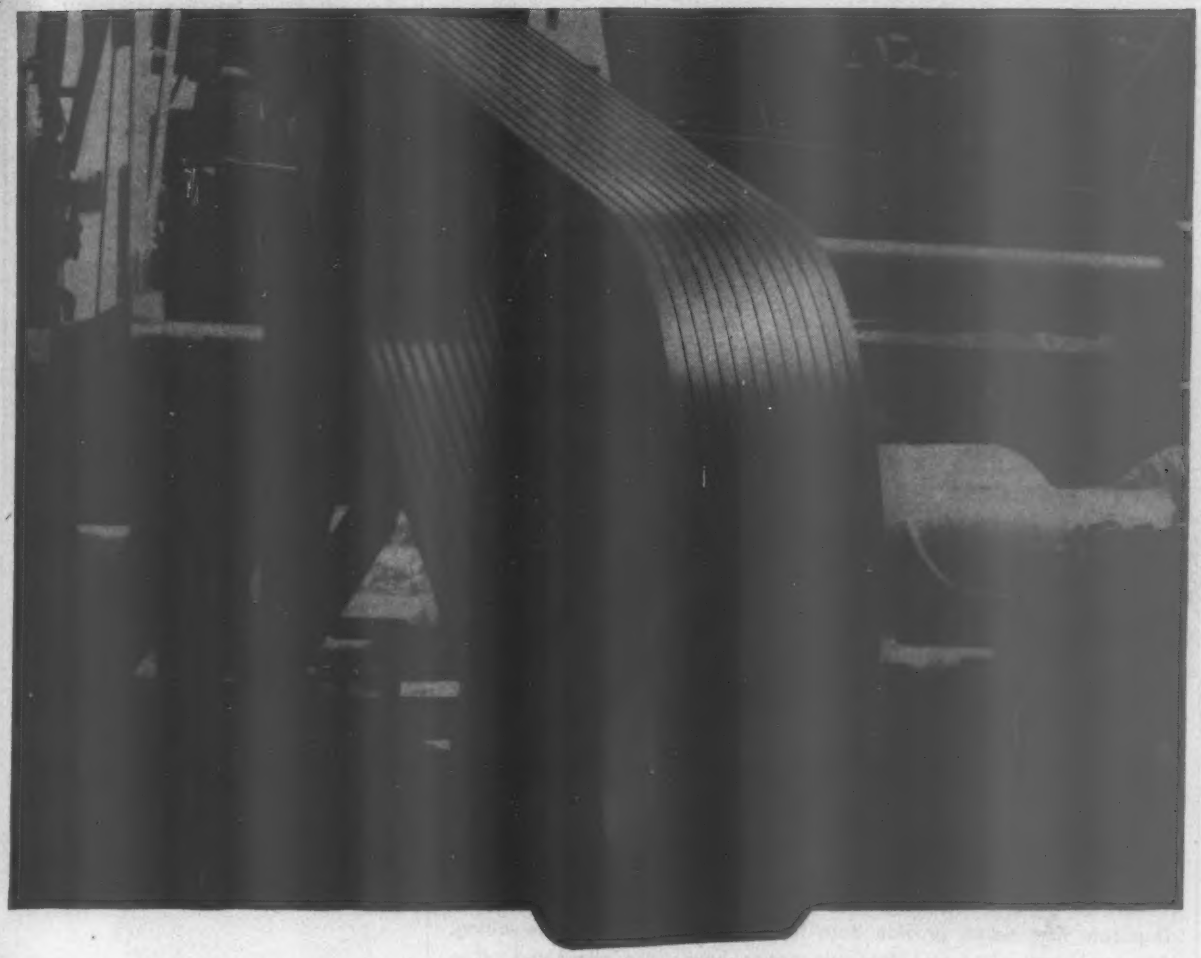
Pegs are adjustable on 4-in. centers. Racks, of all-steel welded construction, can be made to specified size and capacity. Two stock models—20x26x55 and 26x36x66 inches—have 1-ton capacity.

Rack Engineering Co., Connellsville, Pa.

Fork Lift Attachment With Pivoted Tines

Pivoted lift forks may increase your ability to tackle difficult materials handling problems in congested areas. Each tine of this fork attachment can be toed-in from the normal straight position. The adjustment is manual. Spring tension holds either or both of the tines in the straight ahead or toed-in position.

Tines may be set so that their points almost touch in a V, or so



BULL DOG V-BELTS ARE THEIR OWN BEST SALESMEN

. . . they resist cracking and deterioration under severe flexing!

If you are less than happy with your V-Belt performance and life — install a set of BULL DOG V-BELTS. THEY WILL SELL THEMSELVES TO YOU! *They are processed for longer life* of completely new compounds under the closest quality controls. Result: Users everywhere are benefiting by cooler running V-Belts which resist cracking and deterioration under severe flexing.

You'll find other good reasons why Bull Dog V-Belts are paying off — (1) in the *high tensile strength* of the exclusive Bull Dog Cord Section which can take heavy loads and absorb severe shock loads . . . (2) in their low stretch due to a new technique of processing Bull Dog Cords which assures minimum slippage and adjustments . . . (3) in their tough, *extra-wear-resistant* covers of bias-cut heavy fabric which seal the belt against the penetration of grease, moisture, dirt.

Back of these better-built Bull Dog V-Belts is the BWH good name — a name renowned for quality mechanical rubber products for 72 years. There's a BWH distributor in your territory. Call him today.

TOUGH PROBLEMS INVITED — Don't hesitate to ask us or your nearest BWH distributor about your power transmission belting, conveyor belting and hose problems. We are specialists in making mechanical rubber products work *better, longer.*

BWH

DEPENDABLE RUGGEDNESS

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all Principal Cities

PLANT: CAMBRIDGE, MASS., U. S. A. • P. O. BOX 1071, BOSTON 3, MASS.

More than twenty years ago, Universal Products Co., Dearborn, Mich. installed McCaskey Control for production of their numerous styles and sizes of universal joints and drive shafts, gaining . . .

FAST and EFFECTIVE CONTROL of PRODUCTION, COSTS AND TOOLS

Duplicate time tickets provide data for complete control at one-writing. Repeated postings of the same information have been eliminated. One copy is quickly filed on Planning Boards above, providing a visible record of progress and work-in-process by operations.

The other copy furnishes identical data for cost records. Both are immediately available at the end of operations or shifts.

McCaskey Tool Control has cut the loss of tools, time, tool breakage, and excessive inventories. These McCaskey Controls have successfully met changing requirements over the years. They continue today to provide control of essential production operations simply and effectively.

Write for a demonstration or for descriptive folders. No obligation, of course.

THE McCASKEY REGISTER CO.
ALLIANCE, OHIO

Please send me folders describing McCaskey Production, Cost and Tool Control

Name .....

Position .....

Company .....

Address .....

F 1-51

McCaskey
INDUSTRIAL CONTROLS
PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

that one remains in the normal position while the other is rotated to touch it. Maker says that in many cases you can approach and pick up a load at any angle up to 45 degrees.

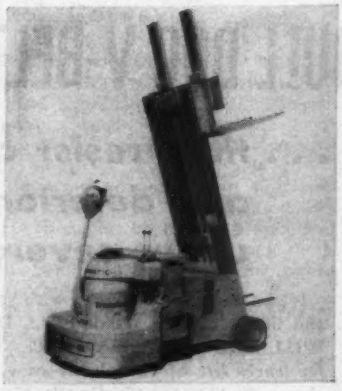
Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 14.

Pallet Truck

This is Shortie—a pallet and skid handling truck that measures only 23½ inches from the front of the truck to the face of the lifting forks. The battery has been mounted above the motor drive unit to give a shorter truck with increased maneuverability.

Standard capacities are 3000 and 4000 pounds for fork lengths from 36 to 48 inches. Battery compartment accommodates 12- or 18-volt batteries from 250 to 400 amperes. Travel speed is 2½ mph. with load, 3 mph. without load.

The Moto-Truc Co., 1953 E. 59th St., Cleveland 3, Ohio.



High-Lift Fork Truck

An extra 11 inches of lift has been added to the Transtacker line of tilting fork lift trucks. These driver-led stackers now telescope to a height of 131 inches. Two models are rated for 2000- and 2500-lb. loads, respectively. In redesigning the line, 650 lb. of weight and 5½ inches in over-all length have been shaved off for increased truck mobility. A completely cast drive

More on next page

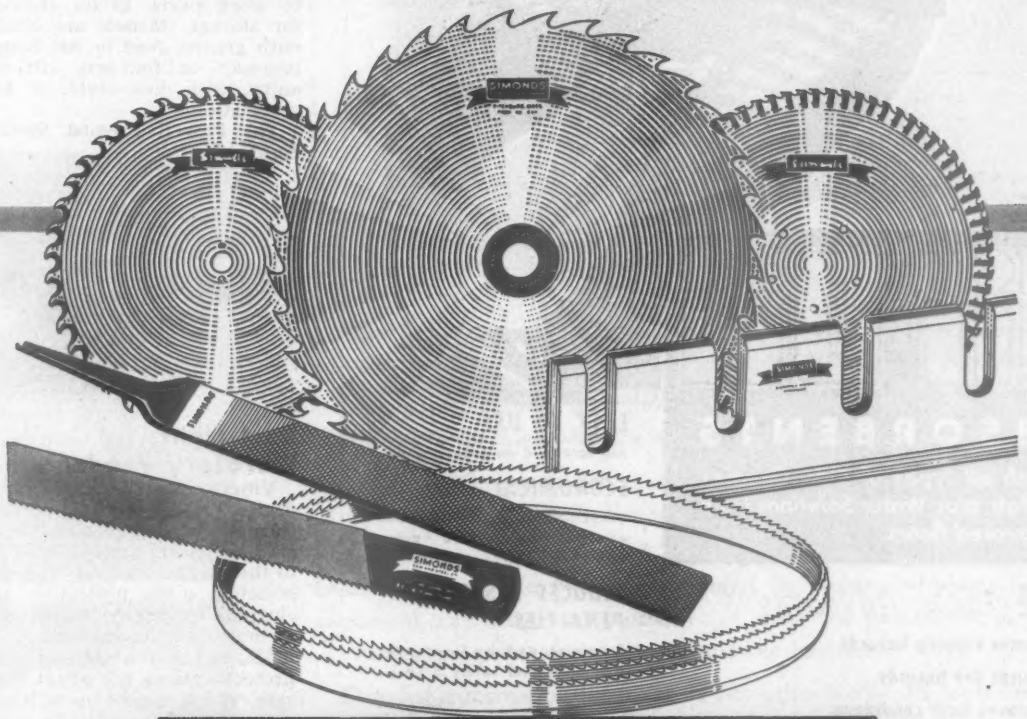
The *Top-Performance* Line...

because

it's the *Top-Quality* Line

of Saws...Knives...Files

(SOLD THROUGH TOP INDUSTRIAL SUPPLY DISTRIBUTORS)



SIMONDS
SAW AND STEEL CO.

FITCHBURG, MASS.

Branch offices in Boston, Chicago, San Francisco and Portland, Ore. Canadian Factory in Montreal, Que.

Oil-Dri
REG. U.S. PAT. OFF.
ABSORBENTS
Absorb all types of Oils, Greases and Fats plus Water Solutions from oil-covered floors.

EASY TO USE
Just spread it on grease spots

ECONOMICAL
Saves time, saves maintenance expense—can be used again and again

REDUCES INSURANCE PENALTIES
Recommended by insurance companies and safety organizations

Check these Advantages

1. Reduces slipping hazards
2. Reduces fire hazards
3. Improves floor conditions
4. Reduces maintenance labor costs
5. Reduces insurance penalties
6. Improves working conditions
7. Permits safer, easier, faster, walking on plant floors
8. Improves plant housekeeping

IDEAL FOR
• Factories • Machine Shops
• Service Stations • Garages
• Grease Pits • Repair Depts.
• Power Plants • Elevator Pits
• Kitchens • Food Plants
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• Breweries and many other uses.

Manufactured Exclusively by

Oil-Dri Corporation OF AMERICA
520 N. MICHIGAN AVE. CHICAGO 11, ILLINOIS

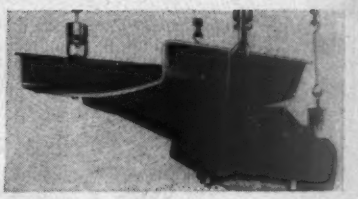
housing protects operating parts in the power unit.

Automatic Transportation Co., 149 W. 87 St., Chicago.

Hopper Box

The hinged door on this hopper box provides the worker on the assembly line with ready access to work parts. Boxes tier easily for storage. Models are available with gravity feed or flat bottom—two-way or four-way lift truck entry, with door styles to fit job application.

The Powell Pressed Steel Co., Hubbard, Ohio.



Dust-Tight Vibratory Feeder

Vibratory feeders of dust-tight design have all working parts—leaf springs, armature, and core—covered by gasket-sealed plates bolted to the magnet casting. Closed construction gives protection against clogging by supply hopper spillage or heavy dust conditions.

Maker says the addition of sealed protection does not affect the feed rate, which ranges up to hundreds of tons per hour of bulk material. Feeder is suitable for Class 2 group installations.

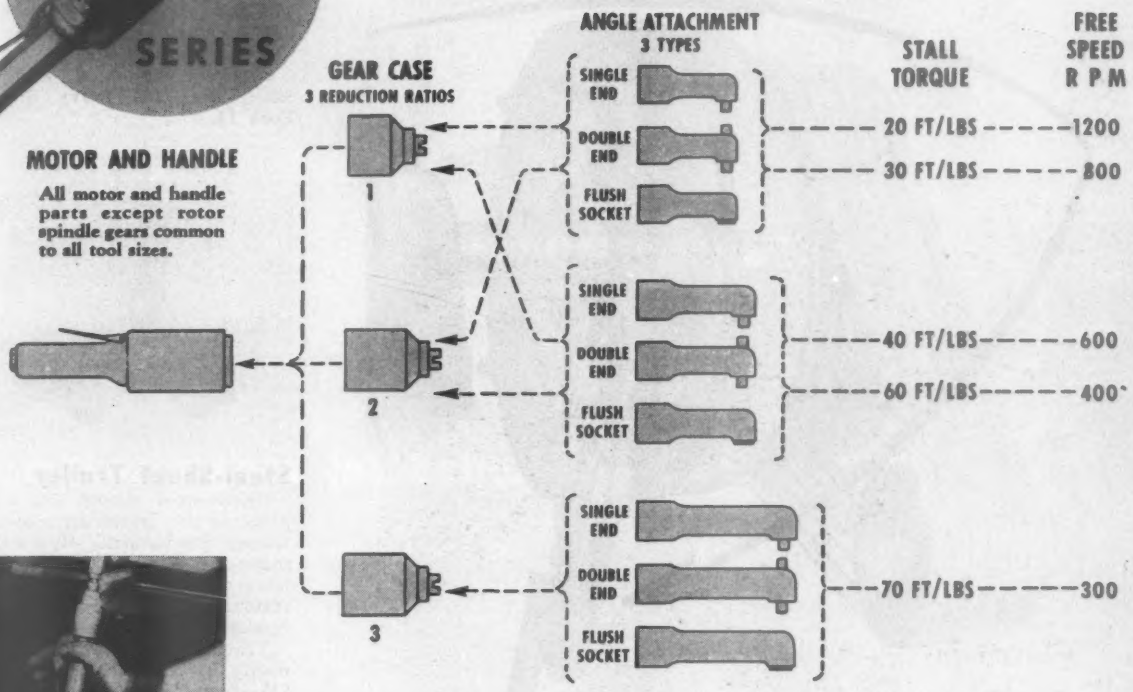
Syntron Co., Homer City, Pa.

All-Purpose Tractor for Spotting Trailers

Through its eight speeds forward and eight in reverse, the Columbia tractor can negotiate an 8% grade with a 28,000-lb. load at 6.7 mph., or haul 15 20-ton vehicles on level ground. Though designed to move

FOR CLOSE CONTROL OF TORQUE IN NUT SETTING . . .

20 to 70 foot pounds



The Keller line of 16C Right-Angle Nut Setters has a complete range of torques for medium-sized bolts—20, 30, 40, 60, and 70 ft/lb.

The diagram shows how the three gear cases and nine different angle attachments are used with the same motor to provide the various torques.

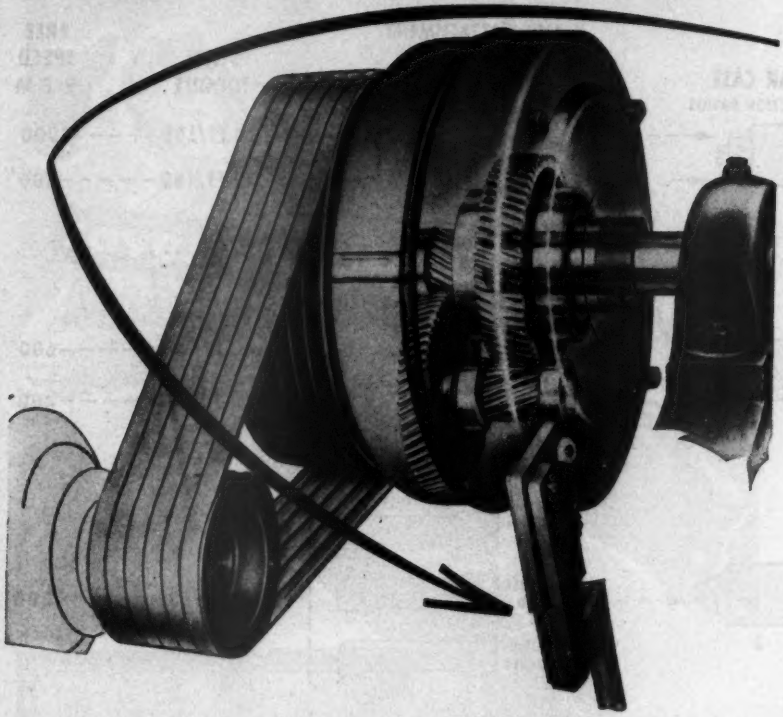
Note how few parts are needed to service and maintain a wide range of styles and sizes, due to the interchangeability of parts.

Keller Nut Setters have all rotating parts mounted in needle or ball bearings . . . spindle bearings mounted in motor end-plates for perfect alignment . . . neoprene control-valve seats for permanent airtight seal . . . flush-type grease fittings . . . adjustable handles.

Detailed information on these or any other Keller air tools for industry will be sent on request.

KELLER TOOL COMPANY • GRAND HAVEN, MICHIGAN

NEW OVERLOAD RELEASE



Provides Instantaneous Protection for Equipment Driven by AMERICAN REDUCTION DRIVES

The American torque-arm Overload Release provides another exclusive advantage for users of American Reduction Drives. It is a simple, foolproof device which automatically and instantaneously disengages the torque-arm from the reduction unit upon sudden shock loads or jamming condition. This disengagement permits the unit to revolve around its concentric input shaft and output hub, thus removing all torque from the driven machine and protecting equipment from damage. The Release is easily reset without tools and continues to provide the same overload protection indefinitely. Write for complete information on the application of this simple protective device for use with American Reduction Drives.

AMERICAN REDUCTION DRIVES

MAIL TODAY!

The American Pulley Company

4210 Wissahickon Ave., Phila. 29, Pa.

Please send me complete informat on on the exclusive American torque-arm Overload Release for use with American Reduction Drives.

NAME _____ TITLE _____

COMPANY _____

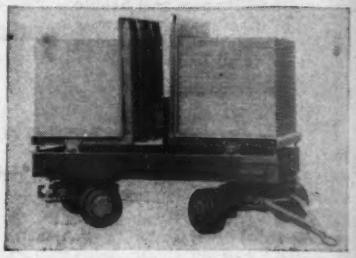
ADDRESS _____

CITY _____ ZONE _____ STATE _____

and spot trailers in warehouses, the machine can be used with auxiliary attachments, such as fork lifts, booms, and snow plows. Top speed for the 100-hp. gasoline engine is 10½ mph.

Transmission, steering, fifth-wheel elevator, and winch are all hydrauiically operated. Fifth-wheel mechanism can lift 40 tons through 18 inches. Winch has 16,000-lb. capacity.

Columbia Truck & Equipment Sales, Inc., 164 Perry St., New York 14.

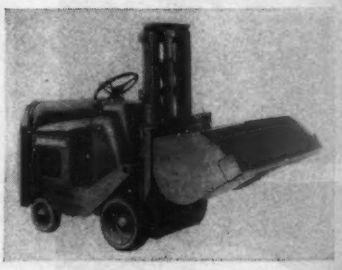


Steel-Sheet Trailer

Oiled steel sheets are kept in place on this trailer by a hydraulic tilting mechanism. Hydraulic-cylinder-operated racks tilt load in toward center for safe transport, return to normal position for unloading.

Tractor-drawn trailer has a capacity of 15 tons. Deck length is 7½ feet, width 36 inches, and height 24 inches.

Phillips Mine & Mill Supply Co., 2324 Jane St., Pittsburgh 3.



Scoop Attachment

The hydraulic scoop accessory in the Towmotor line is a time-saver in handling bulk materials such as coal, cement, or scrap. Simplified attachment makes this unit readily interchangeable with the company's standard pallet forks.

Two-way hydraulic cylinder tips scoop backward 30 degrees for carrying load, tilts it 45 degrees forward for dumping.

Towmotor Corp., 1226 E. 152nd St., Cleveland 10.

More on next page

makes a good job better

Better because variable speed operation pays off in higher rates of production, a more uniform better quality product and more efficient performance of your equipment and your operators.

Make the job better still by using Master Speedrangers because their all-metal construction makes them extremely compact and durable . . . more flexible and adaptable to a wide range of uses. They're available in sizes up to 5 horsepower with speed ranges up to 12 to 1 in most sizes.

Write for descriptive booklet Data 7525 and see how Master Speedrangers can help you get better results on material processing, handling and conveying equipment . . . mixers and agitators . . . machine tool drives . . . testing and calibrating equipment and many other applications.

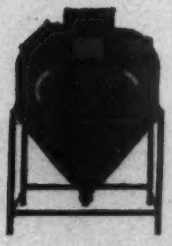
THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO

MASTER SPEEDRANGERS

CUT PRODUCTION and MAINTENANCE COSTS

with FACTORY-ASSEMBLED Pangborn UNITS!

These inexpensive, ready-to-use Blast Cleaning and Dust Collecting units earn you extra profits where custom-built equipment is not practical.



BLAST CLEANING CABINET

cleans metal parts, removes rust, scale, grime, dirt, paint, etc., in a few seconds. Ideal unit for producing clean, smooth surface on pieces up to 60″ x 36″.

BLAST CLEANING CABINETS $315.00 and UP

BLAST CLEANING MACHINE

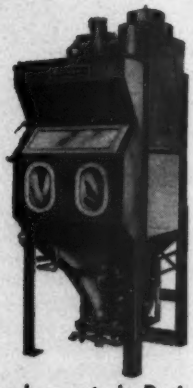
for maintenance and many other uses including the removal of rust, dirt, scale, etc. Economically cleans large objects such as tanks, bridges, structural work preparatory to painting. Six sizes, stationary or portable.

BLAST CLEANING MACHINES $170.00 and UP

UNIT DUST COLLECTOR

traps dust at its source, minimizes machine breakdowns, reduces housekeeping and maintenance costs. Solves many grinding and polishing nuisances and material losses.

UNIT DUST COLLECTORS $286.00 and UP



HYDRO-FINISH CABINET

uses liquid blast, eliminating dust, and reduces costly hand polishing, cleaning and finishing of molds, dies, tools, etc. Removes scale, discoloration and directional grinding lines, prepares surfaces for plating and coating. Holds tolerances to .0001″.

HYDRO-FINISH CABINETS $1295.00 and UP

MAIL COUPON TODAY!

Look to Pangborn for the Latest Developments in Dust Control and Blast Cleaning Equipment

PANGBORN CORP., 2100 Pangborn Blvd., Hagerstown, Md.
Gentlemen: Please send me further information on—

☐ BLAST CLEANING CABINETS
☐ BLAST CLEANING MACHINES
☐ UNIT DUST COLLECTORS
☐ HYDRO-FINISH CABINETS

I am interested in the possibility of using one of these machines for.....

.....

NAME.....

COMPANY.....

ADDRESS.....

CITY..... STATE.....

Pangborn

AIR CONDITIONING

Dehumidifier

Powered with a ½-hp. hermetically sealed Freon condensing unit, the Haertel Dehumidifier "50" will remove up to 50 pounds of water from the air in a 24-hour period. Maker claims you get a 26% increase in efficiency over conventional units.

Units are especially suited for conditioning storerooms and similar closed spaces in double time. All models come with or without means for heat recovery. Automatic disposal of the condensate is optional. If you think that controlled humidity isn't important in your industry, The Haertel Co. may change your mind. Ask for their bulletin listing 32 reasons for humidity control in 23 different lines of industry.

Walter Haertel Co., 2840-4th Ave. So., Minneapolis, Minn.

Fan Circulating Heater

A radiant diffuser with concentric louvers on the Model 428 cabinet-type heater is said to provide draftless circulation and comfortable heating. In addition the cast iron vertical heat exchanger has concentric passages which conform to the air pattern from the propeller-type fan, resulting in better heat transfer.

The Model 428, with 65,000 Btu. per hour input capacity, operates on natural, mixed, manufactured,

and LP-gases. Accessories include automatic controls, room thermostat, limit switch, automatic pilot, humidifier, and manual fan switch for summer air circulation.

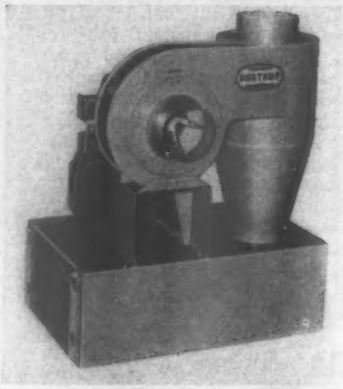
Bryant Heater Div., Affiliated Gas Equipment, Inc., 17825 St. Clair Ave., Cleveland 10.

General Utility Heater

This compact unit heater weighs only 57 lb., measures 16x13x17 inches, yet will heat small buildings, locomotive cabs, or similar enclosed spaces. Unit will also spot auxiliary heat for you in out-of-the-way places.

Designed for either steam or hot water, these heaters can utilize the waste heat from the heated jacket water of gas, gasoline, or diesel engines. Air delivery is 572 cfm. at 70 degrees F.

Young Radiator Co., Racine Wis.



Portable Dust Collector

The compact Dustkop 8N50 dust collector is small enough to be portable and comes ready to install with the addition of ordinary sheet-metal piping. Rated at 885 cfm. with 3-in. static suction, it is especially suited for use where outside exhaust of cleaned air is required.

A self-clearing, paddle wheel fan, powered by a ¾-hp. motor, clears lint, shavings, and dust from woodworking and grinding operations. Cyclone separator deposits particles in the base of the unit.

Aget-Detroit Co., 612 First National Bank Bldg., Detroit.

•

PORTABLE HEATER, called Thermobloc, provides a complete heating unit, including fuel tank, mounted on easy operating trucks. Unit can be moved about on temporary jobs, until you find the exact spot for most effective heat diffusion. Prat Daniel Corp., East Port Chester, Conn.

More on next page

with Pangborn Dust Control there's...

DUST used to blanket the Daystrom plant and nearby neighbors in Olean, N. Y. But no more! Since Pangborn Dust Control equipment was installed, 788 cubic feet of dust has been removed from the air every 16 hours. That's enough dust to fill an average room right up to the ceiling!

Profits from the Pangborn Dust Control system are already visible at Daystrom. Electric motors, precision machinery and even the interior paint job all need far less maintenance. In addition, there's a bonus: the dust collected can be burned—which adds up to a big cash saving on fuel.

HOW ABOUT YOUR PLANT?

Find out about Pangborn Dust Control. A free "Pangborn Dust Survey" costs nothing—but will show you how to *turn dust into profits.* Write for details and a copy of Bulletin 909A to: PANGBORN CORPORATION, 2100 Pangborn Blvd., Hagerstown, Maryland.

Look to Pangborn for the Latest Developments in Dust Control and Blast Cleaning Equipment

OP THE DUST HOG from stealing profits with

Pangborn

DUST CONTROL

THOMAS

Flexible ALL METAL
COUPLINGS
FOR POWER TRANSMISSION
REQUIRE NO MAINTENANCE

Patented Flexible Disc Rings of special steel transmit the power and provide for misalignment and end float.

Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:
½ to 40,000 HP
1 to 30,000 RPM

Specialists on Couplings for more than 30 years

THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT.

NO MAINTENANCE PROBLEMS.

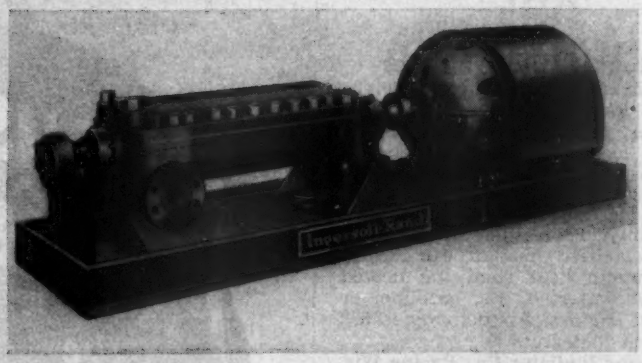
ALL PARTS ARE SOLIDLY BOLTED TOGETHER.

Write for the latest reprint of our Engineering Catalog.

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

 Begins on page 146

AUXILIARY EQUIPMENT

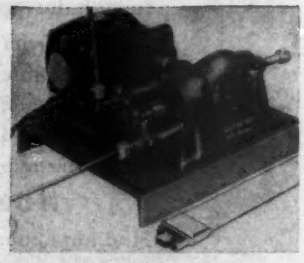


Multi-Stage Centrifugal Pumps

Flexibility and ease of maintenance have been designed into a new line of multi-stage centrifugal pumps. Units can be adapted to a wide range of general high-pressure industrial jobs requiring pressures up to 1200 psi., capacities up to 1600 gpm. Future changes in system load can be met by altering the pump's operating characteristics—new combinations of impellers and channel rings can be installed at any time on the original shaft.

Design features include cylindrical-bore, horizontally split casing, and compact unit rotor assembly. The entire rotor assembly —shaft, impellers, and channel rings—is easily removed from and installed in the smooth bore casing. Class HMTA pumps are built in 3-, 4-, 5-, and 6-in. sizes with from 3 to 9 stages. Company catalog fully describes complete line.

Ingersoll-Rand Co., Phillipsburg, N. J.

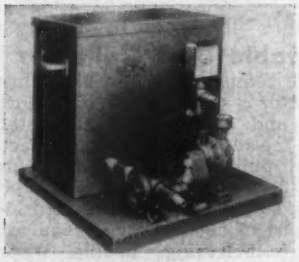


Metering Pump

A controlled volume pump, called miniPump, handles flow in the cc. per hour range with metered accuracy. You can use one for pilot plant operations or to inject precise amounts of clear liquids in production processes.

Operating pressures of this positive displacement pump run up to 1000 psi.—delivery ranges between 3 and 800 cc. per hour. Graduated screw adjustment changes plunger displacement to vary flow.

Milton Roy Co., 1300 E. Mermaid Lane, Philadelphia.



Paint Heater

This double unit paint heater will supply up to 28 gph. of hot paint for installations using two or more spray guns. Basically two units on a common frame, it heats, paints and finishes to 160-200 degrees F.

Heater comes up to operating temperature in 15 minutes. Constant circulation of the paint is said to minimize temperature drop in paint lines. Unit is explosion proof.

Bede Products, Inc., 4311 Ridge Rd., Cleveland 9.

More on next page

NOW... Wire Rope Slings

with flexibility comparable to fiber rope

ACCO REGISTERED WIRE ROPE SLINGS rate high with Safety Engineers. However, operating men are often reluctant to adopt new equipment when it means a departure from long-established ways of handling standard jobs.

Maybe you don't *have* to depart from established custom to enjoy the advantages of ACCO Wire Rope Slings.

The picture above illustrates a case in point. The hitch is a typical fiber rope hitch. But the sling is not fiber rope. It is a Double ACCO-LOC Cable Laid Grommet. It has all the safety, dependability and uniformity of an all-steel, machine laid sling with flexibility comparable to fiber rope. The patented splice develops the full strength of the sling body—plus giving an armored section to use at point of greatest wear.

Like all ACCO Registered Wire Rope Slings, these grommets are rated as to capacity—proof-tested to twice the rated capacity.

Here's a possible way to reduce material handling costs, a certain way to have new safety, reliability and ease of accurate sling inspection. Write today for complete and detailed information about Double ACCO-LOC Cable Laid Grommets.

MEMBER THE NATIONAL SAFETY COUNCIL

ACCO

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

AMERICAN CHAIN & CABLE

WIRE ROPE SLING DEPARTMENT

TRADE MARK

In Business for Your Safety

ACCO Registered WIRE ROPE SLINGS

NEW, FREE BULLETIN

Helps You Solve 8 Shipping Room Problems

Read How The Right Bostitch Stapling Machines Can:

1. SAVE SPACE — With speedy Bostitch bottomers keeping pace with production, you don't have to set up and store containers in advance.

2. BREAK BOTTLENECKS — Bostitch machines are so fast, many manufacturers put them right into their production lines.

3. IMPROVE FASTENING — Unlike adhesives, Bostitch staples can't let go, regardless of temperature and humidity conditions.

4. REDUCE DAMAGE — Many Bostitch users have proved that properly engineered corrugated containers often give better protection than bulky wooden crates.

5. IMPROVE APPEARANCE — Bostitch staples do not interfere with container design or obliterate part of the printed message.

6. STOP PILFERAGE — Inexpensive Bostitch machines clinch staples so tight that pilferage can be immediately detected — eliminating hidden losses.

7. FIT INVESTMENT TO NEEDS — Choose inexpensive hand- or foot-operated Bostitch machines when production is not large; high-speed models for low fastening costs on large production.

8. CUT COSTS — The many advantages of Bostitch stapling often save 50% — sometimes as much as 80% — in fastening costs.

SEND FOR BULLETIN 267 TODAY!

This free bulletin illustrates and describes 30 of the more than 800 Bostitch hammers, tackers, stapling machines and wire stitchers. It shows you how to use them . . . gives proof of big savings in time and money in twelve important shipping operations. Based on more than 50 years' experience in fastening, this bulletin may show you a quick, easy solution to your fastening problems. Get your copy by mailing the coupon below today.

PLEASE ATTACH THIS COUPON TO YOUR FIRM'S LETTERHEAD

BOSTITCH, 404 Mechanic Street, Westerly, R. I.
Please send me your new, free Bulletin 267 — "How Bostitch Can Save You Time and Money in 12 Important Shipping Room Operations."

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BOSTITCH
fastens it better AND FASTER with wire

ALL TYPES OF MACHINES FOR APPLYING STAPLES
ALL TYPES OF STAPLES APPLIED BY MACHINES

Trade-Mark "Bostitch" Registered U. S. Patent Office and Foreign Countries.

NEW AUXILIARY EQUIPMENT

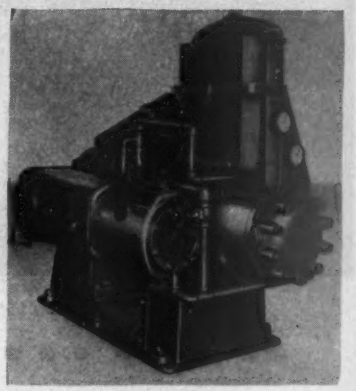
Begins on page 162

Collector for Refiring Carbon Dust

This tubular dust collector will let you refire much of the high carbon dust that frequently escapes unburnt from boiler furnaces. Moreover it will do the job without recirculating the fly ash, too, says the maker.

Separation of high-carbon particles from low-carbon fly ash is done within a single unit with one pass of the gases. System is said not to increase normal draft loss through the dust collector unit. Ask maker for P-D Decantation bulletin.

Thermix Corp., Greenwich, Conn.



Natural Gas Compressor

The Lorain Model A-9 compressor is a new unit for compressing natural gas under high pressure. The single-stage unit is driven by a multi-fuel gas engine through an overhung crankshaft. This arrangement matches compressor characteristics to engine horsepower output.

Compressor cylinder has bottom discharge to prevent accumulation of gas condensates. Full force-feed lubrication includes lubrication of the metallic rod packings.

White-Roth Machine Corp., Lorain, Ohio.

Water Deionizer

A single-tank deionizer is said to make high-quality deionized water practical for plants that have found evaporated or distilled water too expensive. The unit, utilizing the zeolite exchange process to produce mineral-free water, is also said to remove silica and CO_2.

Elgin Softener Corp., Elgin, Ill.

More on next page

These Jenkins Valves installed on pipelines serving the pan floor are a few of the 5200 in use at Supreme Sugar Refinery. In addition, several patterns of Jenkins bronze, iron, and steel valves are used to control steam, water, and other vital lines.

There are few tougher proving grounds for valves than sugar mill service. Sticky, sluggish fluids soon seek out any weak spots in design and construction.

Over 5200 valves are maintained in regular service by the Supreme Sugar Refinery of Tallieu, Louisiana. More installations are continually being made as new plant additions go up. Long ago the management learned that, to insure the lasting efficiency required for profitable operation, the *only really safe economy* is to choose the best valves money can buy. For this reason, they standardized on Jenkins Valves.

In fact, Jenkins Valves have been the consistent choice of leading engineers, architects, and contractors everywhere for more and more of the nation's most notable buildings, wherever cost-wise, future-minded planning is the rule. For plant expansion, as well as new plants—large or small; for the commercial and institutional buildings that dominate today's changing skylines, Jenkins Valves are providing an extra measure of dependability, safety, and low maintenance.

Despite this extra value, *you pay no more* for Jenkins Valves. Let the Jenkins Diamond be your guide to lasting valve economy. Jenkins Bros., 100 Park Avenue, New York 17; Jenkins Bros., Ltd., Montreal.

Sold through leading distributors everywhere

JENKINS
LOOK FOR THE DIAMOND MARK
VALVES
TRADE JENKINS MARK

Jenkins Bros

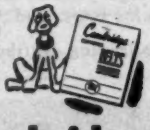
Imagine your dog's delight on seeing a solid column of biscuits 160' long and 42" wide! That's the carrying surface of this Cambridge Woven Wire Conveyor Belt in a recirculating oven at Kendall Foods Company, Bell Gardens, California.

Balanced Weave, specified for this installation, is low in cost, eliminates creeping of the belt on the drive pulley, and provides high tensile strength. Open mesh of the belt allows free circulation of heat within the oven . . . crumbs and broken bits of biscuit fall through the belt, cannot foul up automatic packaging equipment at the end of the oven.

Whether you're baking biscuits, processing meat or canning vegetables, there's a Cambridge Woven Wire Conveyor Belt to help mechanize your production. Stainless steel to meet sanitary codes is a standard material of construction for our food plant customers. Call in your Cambridge field engineer today, let him explain the superior construction features of . . .

Cambridge Woven Wire Conveyor Belts

WRITE FOR FREE MANUAL illustrating and describing conveyor belt installations for food, metal-working, chemical, ceramic and other processes.

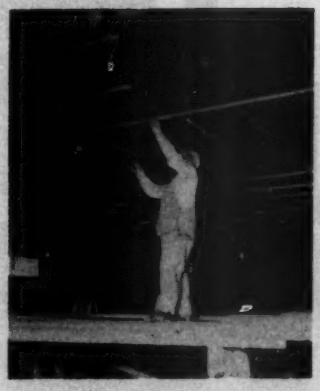


The Cambridge Wire Cloth Co.
Dept. E • Cambridge 1, Md.

WIRE CLOTH | METAL CONVEYOR BELTS | SPECIAL METAL FABRICATIONS

OFFICES IN PRINCIPAL INDUSTRIAL CITIES
See "Belting - Mechanical" in your Classified Telephone Directory.

BUILDING MATERIALS

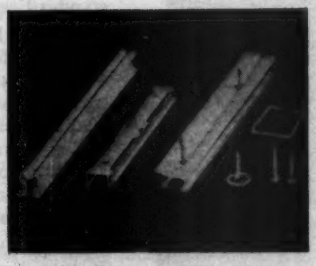


Acoustical Board for Suspended Ceilings

Glass fibers are bonded together with a stable resin in Fiberglas board to provide a ceiling material that is easy to install and maintain. For use in suspended ceilings, it has a noise reduction coefficient of 80% for 512-cycle frequency sound, is noncombustible, sanitary, and thermally efficient. Maker claims it will not warp or sag under varying temperature and humidity conditions. Spray painting with a water-base paint does not decrease its acoustical value. You can use ordinary wallpaper cleaner or a vacuum cleaner for periodic maintenance.

Panels are suspended on a grid system of extruded aluminum T-section. The boards rest on the flanges of the T-members. Fiberglas board is ¾-in thick, weighs ½ lb. per square foot. It can be readily cut with a knife to fit irregular boundaries.

Owens-Corning Fiberglas Corp., 16 E. 56 St., New York.



Nailing System

Metl-Lock is a system for nailing to metal to support suspended acoustical ceiling tiles. The annular metal nails are driven into an inverted V-shaped nailing course in steel channels. The 45 degree angles of the inverted V serve as a guide for off-center nails, as well as providing a constant spring tension to grip nails in place.

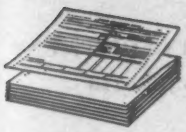
Mid-West Acoustical & Supply Co., Cleveland 2.

Asphalt Applicator

The Turner Applicator permits one man to do the work of many in applying cold asphalt to flat or slightly inclined roofs. The self-propelled machine deposits asphalt flow in front of a flanking brush which spreads the material evenly. The machine, weighing 200 lb., can be roped to the rooftop in three sections.

Turner Applicator Co., Port Jefferson, Ohio.

More on next page

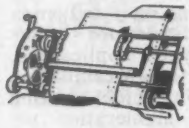


KANT-SLIP
continuous forms

Feeding-aligning devices:
THE REGISTRATOR PLATEN

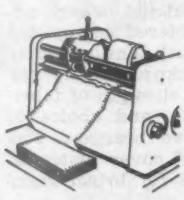
AUTOMATIC LINE FINDER

Advances form into new writing position in one motion



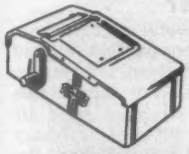
DUAL FEED

Registers 2 *different* forms for 1 continuous typing operation



BURSTER-IMPRINTERS

Sign, date, number, trim, tear off, stack Kant-Slip forms

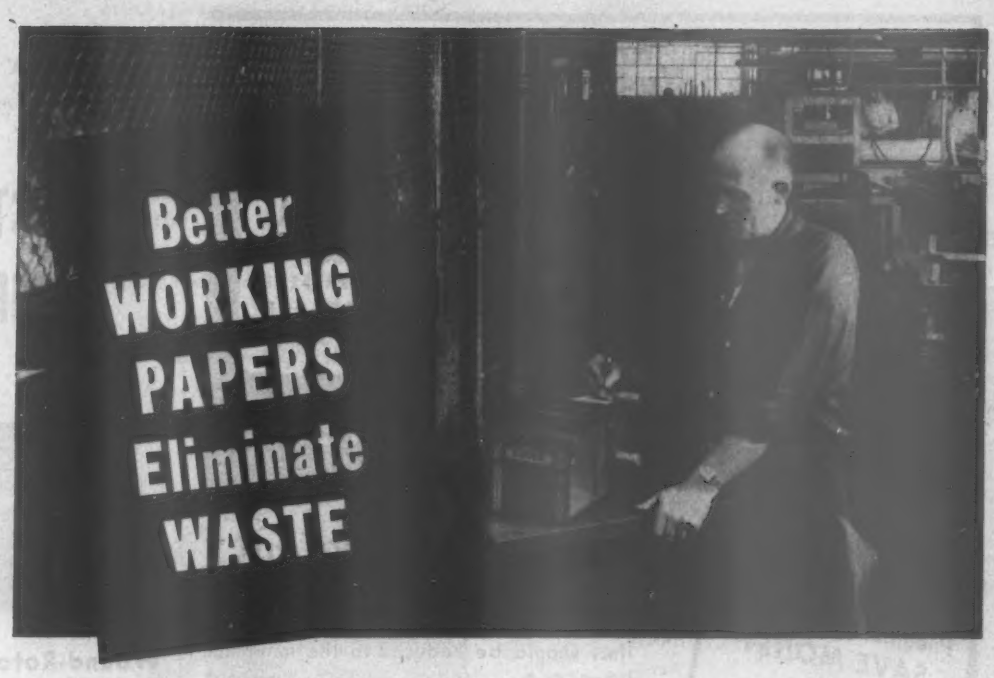


FORM-FLOW REGISTERS

Better records . . . by hand

UNIT ZIPSET FORMS

Carbon interleaved



STANDARD REGISTER *"Paperwork Simplification"!*

Too much costly clerical work in your plant? Giving people too little help in getting their jobs done RIGHT—without wastes of time, labor, material or money? Break down the systems of control. Apply the *scientific method* of work simplification to each element . . .

A. Develop The Best Procedure. With the aid of Standard Register procedure flow charting a New Jersey specialty manufacturer improved control of repair work by combining six different and separately originated records (14 copies) into one 8-part continuous form. *See Business Aids.**

B. Simplify The Writing Method. In another instance, a manufacturer applied Form-Flow Registers and Kant-Slip continuous forms to four plant systems (Receiving, Inspection, Material Requisition, Work Ticket). They enable clerks to write orderly records faster, produce sufficient copies at one writing (without rewriting of identical data) and to check against loss of any record. *See Business Aids.**

C. Design The Most Efficient Form. An Indiana producer of technical reports constructed an 8-part Kant-Slip continuous form for typewriter to handle completely the processing, billing, and shipping of orders. *See Business Aids.**

THE STANDARD REGISTER COMPANY
301 Campbell Street, Dayton 1, Ohio

Associated Companies: PACIFIC COAST: Sunset McKee Company, Oakland 6, California. CANADA: R. L. Crain Limited, Ottawa. GREAT BRITAIN: W. H. Smith & Son, Ltd., London.

***GET "BUSINESS AIDS"—FREE!**

The industrial issue of "Business Aids," the Standard Register magazine, gives full details on these and other first-hand case histories of how "Paperwork Simplification" plus Standard Products, speed up production.

Order your copy of Business Aids today—MAIL THIS COUPON!

The Standard Register Company,
301 Campbell St., Dayton 1, Ohio

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Company_____

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Do you handle Granular Materials?

THERE ARE 6 WAYS THAT DRACCO Pneumatic Conveyors WILL SAVE YOU MONEY

Have DRACCO Check YOUR PRESENT METHODS FOR POSSIBLE SAVINGS

also REDUCE LABOR COST

DRACCO Pneumatic Conveyors SAVE MONEY

1 Reduce labor cost.
2 No loss of material in handling.
3 No contamination.
4 Eliminates dust.
5 Material received in bulk at lower cost.
6 Low maintenance cost.

Material handling is an everyday expense that should be reduced to the minimum. DRACCO Pneumatic Conveyors are SAVING MONEY for many in handling chemicals, grains or granular materials. In most installations the cost of labor is reduced tremendously. DRACCO Pneumatic Conveyors are flexible... materials are moved from receiving to storage in any part of the plant, even up many floors. It is possible to move materials from one building to another, over or under streets or railroad tracks. Why not have DRACCO Engineers check your handling methods for possible savings?

For Further Information Write

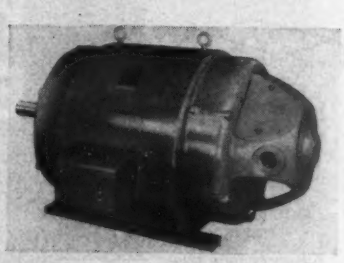
DRACCO CORPORATION

4091 E. 116th St., Cleveland 5, Ohio New York Office: 130 W. 42nd St.

DUST CONTROL EQUIPMENT
PNEUMATIC CONVEYORS • METAL FABRICATION

Begins on page 146

ELECTRICAL EQUIPMENT



Wound-Rotor Induction Motor Line

Type E-M wound-rotor induction motors are designed for heavy duty, variable speed applications. Operating characteristics suit them for jobs requiring high starting torque, or long acceleration periods.

Standard models are built in ratings from 30 to 1500 hp. with drip-proof construction. Splashproof or enclosed forced-ventilation models are available. Ratchet wheel adjuster provides metered step-by-step adjustment of brush tension. Other features are crackproof steel bar feet, high impact strength of fabricated steel frame, and choice of ball or split-sleeve bearings. Fingertip removal of cover plates affords easy access for brush maintenance.

Electric Machinery Mfg. Co., Minneapolis 13, Minn.

Motor Starter

A new Life-Linestarter combines motor starter, motor protection, and disconnect in a redesigned, space-saving enclosure. For across-the-line starting of squirrel cage induction motors, or as a primary switch for wound rotor motors, the unit features the Westinghouse AB De-ion circuit breaker. Slamproof self-indicating interlocked handle takes up to three safety padlocks.

Capacities range from ¼ to 100 hp. and 110 to 600 volts polyphase. You can get NEMA sizes 0 through 4, and NEMA type enclosures 1, 1A, 3, 4, 5, 7, and 9. Installation and maintenance are facilitated by the standardized enclosures, compact design, straight-through wir-

Trucks powered with Gould "Thirty" batteries go at full power months after ordinary batteries have begun to slow down.

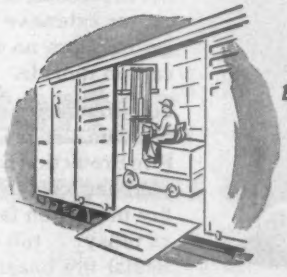
96% of the entire working surface of Gould's new "Z" Plate is *regenerative* power-producing material. The grid itself is 66% more resistant to deterioration. Grid porosity is reduced 85%. This is why the

GOULD "THIRTY" BATTERY
with new "Z" Plates is
"America's Finest Industrial Truck Battery"

Position loads faster. Lift and maneuver at same time. Stable on highest lifts.

Battery trucks do more work. Always ready to go. No unpredictable down-time. Foolproof speed controls.

Nothing Beats GOULD-POWERED TRUCKS!



Battery trucks are smooth, easy to handle, cut driver fatigue. Quiet, odorless, safe.

GOULD

STORAGE BATTERIES

GOULD-NATIONAL BATTERIES, INC.

puttin's a breeze . . .
his mind's at ease

Yes sir, here's a chap that can really concentrate on a putt! He knows that a flash fire can't stop production at his plant . . . equipment, materials, buildings, and the lives of employees are fully protected with modern, approved C-O-TWO Fire Protection Equipment.

You, too, can have this same ease of mind about your factory, mill, warehouse, power station or research center. There are fire hazardous areas that particularly need C-O-TWO fast, positive fire protection: spray booths, dip tanks, solvent baths, electrical equipment enclosures, mixing vats, storage tanks, pump rooms, record vaults, store rooms, especially anywhere there's danger of flammable liquid or electrical fires. At many locations a C-O-TWO Combination Smoke Detecting and Fire Extinguishing System is a "must". The first trace of smoke in a protected area sounds an alarm . . . then fast, clean, non-damaging, non-conducting carbon dioxide blankets the fire, putting it out in seconds, before it spreads and causes extensive damage . . . no lingering odors, no water damage with carbon dioxide.

So, whatever your fire protection problem, let an expert C-O-TWO Fire Protection Engineer help you in planning complete and up-to-date fire protection facilities now. Write us today . . . tell us about your particular fire hazards, our experience is at your disposal . . . there is no obligation of course.

C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY

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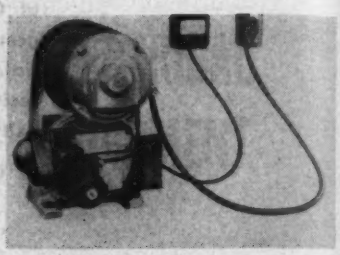
Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

ing, and front-removable component parts.

Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30.



Remote Controls For Electric Power Drive

A packaged unit for remote control of Sterling Speed-Trol power drives includes mounting bracket, reversing motor, chain and sprockets, friction clutch, chain guard, and remote "Fast-Slow" station. These controls are available with new factory models, or can be mounted by user on current designs in the field. Electric remote speed indicator is optional.

Speed-Trol variable speed power drives are available in ½- to 25-hp. ratings with 2, 3, or 4 to 1 speed variation in a range of speeds from 2000 to 26 rpm. Positive adjustment of pulleys provides infinite speed variation and a steady flow of power at any selected speed.

Sterling Electric Motors, Inc., 5401 Anaheim-Telegraph Rd., Los Angeles 22.

•

A SMALL MULTI-POLE CONTACTOR, Size 00, with reversible contacts is said to provide speedy circuit conversion without additional parts. Various circuits can be handled quickly by removing four screws and inverting and transposing the contacts. Arrow-Hart & Hegeman Electric Co., Hartford, Conn.

CIRCUIT BREAKERS in the Multibreaker line now come in raintight (NEMA type 3) enclosures. Conduit hubs are furnished in various sizes on top of the steel enclosure. Bottom or side hubs are not needed, since all side, bottom, and back knockouts are below the lowest electrical part. Square D Co., 6060 Rivard St., Detroit 11.

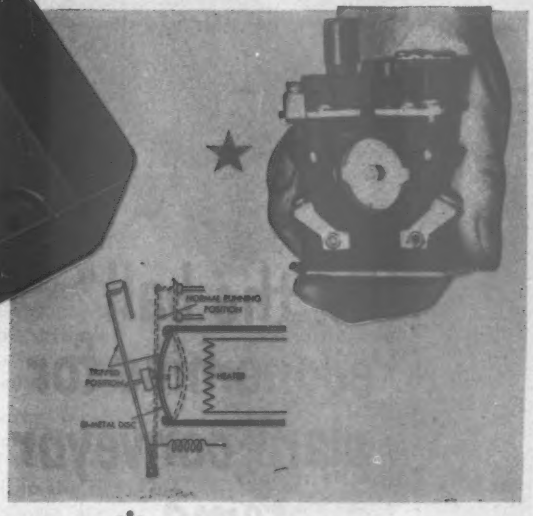
EXTENSION CORD REEL pays out and automatically retracts 25 feet of cord to provide power for lighting or hand tools in out-of-the-way locations. Stop action holds cord at length desired. Rating is 10 amp., 250 volts. Appleton Electric Co., 1701-59 Wellington Ave., Chicago 13, Ill.

More on next page

YOU CAN BE SURE.. IF IT'S

Westinghouse

CUT MOTOR BURNOUTS



with the Life-Linestarter* . . . positive protection against overloads

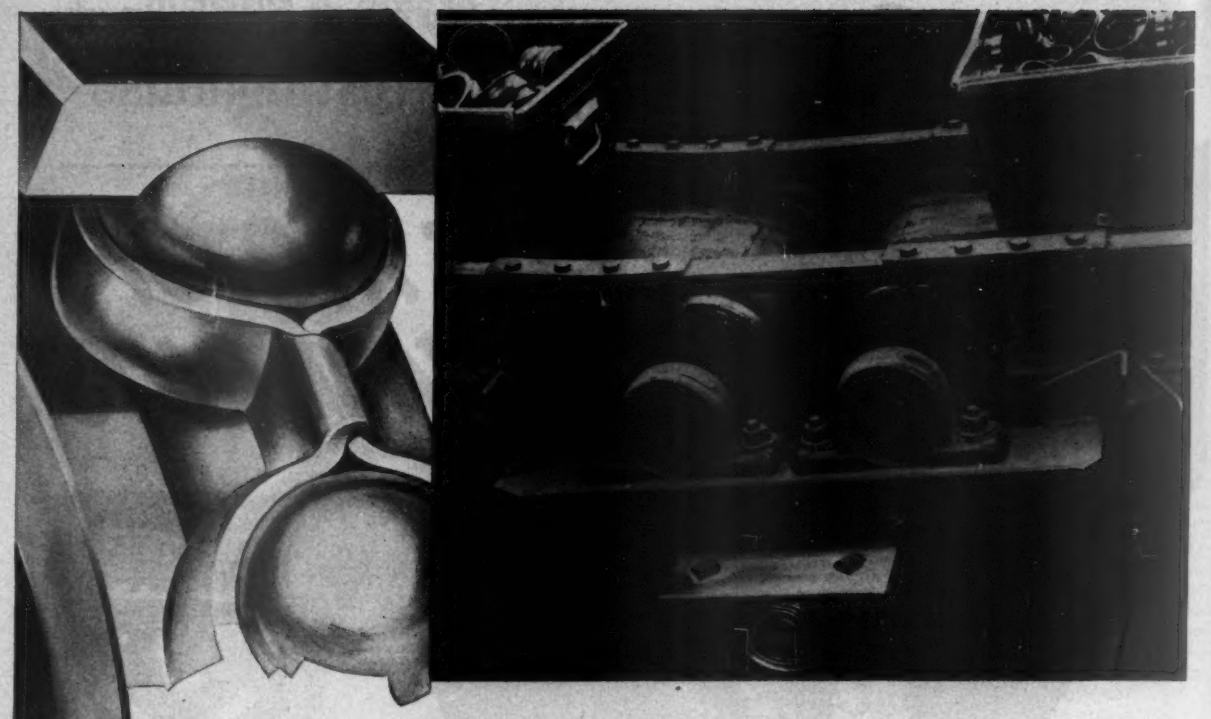
Stop worrying about the inconsistencies of ordinary overload relays.

Investigate the new Westinghouse Life-Linestarter with the bi-metal DISC overload relay which provides a positive contact pressure, with snap action. It retains its precise calibration regardless of the number of operations. It's the only relay that may be set for "automatic", "hand" or "no-stop" operation.

Positive protection is but one of the advanced features offered by the new Life-Linestarter. It's best because of its uniformity and completeness of line (NEMA sizes 0 through 4, to 100 hp, 600 volts), superior performance, ease of installation and other cost-saving advantages.

*Trade Mark

Ask your nearby Westinghouse representative for the "inside story"—a Trans-Vision presentation—at your convenience. Or write for booklet B-4677. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-30024



"On the ball" economies for plant conveyor systems

8 years of operation with no servicing except infrequent lubrication . . . that's the record of the Fafnir Ball Bearing units installed on the conveyor shown. And that's the type of bearing performance which puts materials handling into the low-cost bracket. During the war, these units were running 24 hours a day. Since then, at least 80 hours a week.

The complete bearing installation on the 3-pulley snubbing device of the conveyor includes 6 Fafnir LAK 1-11/16" Pillow Blocks. Four of the blocks are mounted right side up and two, upside down. The conveyor transfers heavily loaded work boxes from one plant floor to another. Like all Fafnir Industrial Units, these LAK Pillow Blocks have the famous Fafnir Wide Inner Ring Ball Bearings with self-locking collars . . . easiest of all to install.

Let your Fafnir distributor show you how to cut materials handling costs with Fafnir Ball Bearing Industrial Units that give dependable, long-life service. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR
BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

WHAT'S NEW IN EQUIPMENT

Begins on page 146

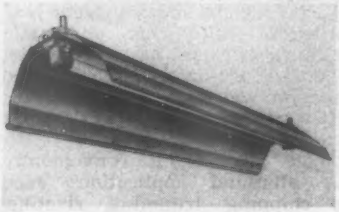
LIGHTING

All-Weather Lamp for Electric Lantern

A new Westinghouse lamp gives electric hand lanterns the advantages of sealed-beam lighting. The weather-proof all-glass lamp is said to provide watchmen and plant protection groups with twice the beam candlepower of conventional lanterns that have separate bulb and metal reflector. Unlike automotive sealed beam headlamps, this one has a clear lens for spotlighting purposes.

Lamp is powered by a 6-volt battery contained in an aluminum case. Unit weighs 44 ounces.

Westinghouse Lamp Div., Bloomfield, N. J.



High Bay Reflectors for Mercury Lamps

The Guth 3 KW high bay reflector uses Alzak aluminum for maximum light control and high lighting efficiency with mercury vapor lamps. Fixture is equipped with sturdy lampholders, drop guards, wire connecting boxes, and heavy-duty hanging loops. Reflector provides 55-deg. crosswise shielding.

The Edwin F. Guth Co., 2615 Washington Blvd., St. Louis 3.

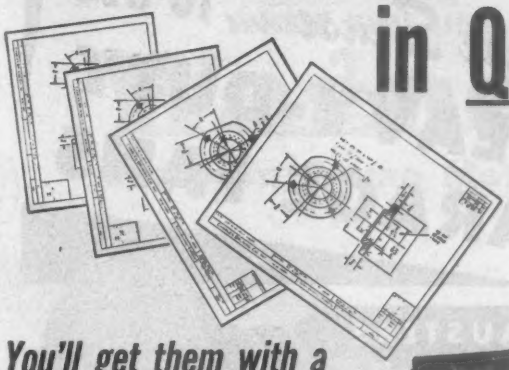
Fluorescent Fixtures

Fixtures in the All-Brite RLM Industrialist line feature porcelain enamel finish with high reflection factor. Standard or multiple twin- or triple-turret lampholders have means for either chain or stem suspension. Joiner channels are said to simplify end-to-end alignment in continuous rows. Bulletin 104 FL tells the complete story.

Fluorescent Fixtures of California, 3320 18 St., San Francisco.

More on next page

Want Quality Copies in Quantity?



You'll get them with a Bruning Whiteprinter

The Bruning Whiteprinter produces quality copies — crisp, easy-to-read positive prints—in any quantity you desire. Get hundreds, if you want — with the last copy as clean and sharp as the first.

A Bruning Whiteprinter is the cleanest, fastest, most economical way to copy your drawings, records and reports. It handles any size up to 42" wide by any length. It makes black-on-white copies, or prints in any of 20 color combinations.

NEEDS NO PLUMBING OR EXHAUST DUCTS

To operate the Bruning Whiteprinter, just place the material* to be copied on a sheet of Whiteprint paper and insert both into the machine. Within seconds you have your copy — errorproof, smudge-proof, completely developed. Prints come out flat, dry and neatly stacked.

You have no installation troubles, either, with your Bruning Whiteprinter. You need only connect it to your electric supply, and it is ready to operate. It requires no plumbing; it needs no exhaust ducts.

Get top-quality copies in the quantity you want. Get them inexpensively and *on time*. Get a Bruning Whiteprinter! For full details, send coupon or write *Charles Bruning Company, Inc., Dept. F-11, 100 Reade St., New York.*

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PERFECT PRINTS...WITHIN SECONDS...FOR PENNIES
BW WHITEPRINTERS

**If your original is opaque, the Bruning Whiteprinter quickly copies it into translucent stock from which you make as many Whiteprints as you want.*

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Please send me free Booklet A-1056 describing the Bruning Whiteprint Process.
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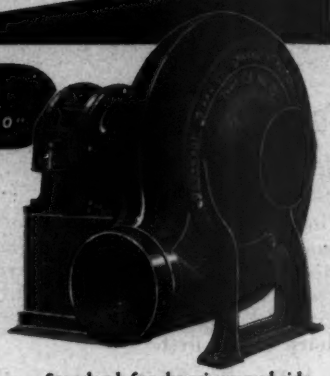
Good Horse Sense . . . to Use These HEAVY-DUTY CLARAGE FANS

TYPE CI EXHAUSTERS

Capacities to 4000 CFM; Pressures to 20"



Nothing shoddy or flimsy about these smaller Clarage industrial fans. They are O.K. for continuous service — built to the *same exacting standards* as the largest Clarage equipment.

Try them! . . . then you will readily understand why we call them "HEAVY-DUTY" — *and mean just that!*

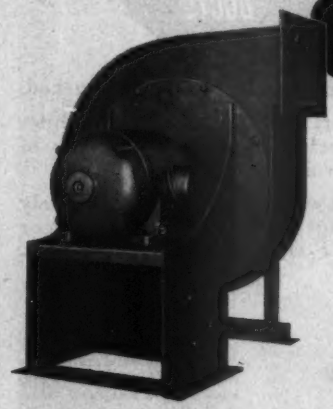
Use Clarage Type CI Exhausters for removing excess heat, dust, smoke, odors from any manufacturing operation — for supplying air to oil burners, as over-fire fans, etc. Use them for pneumatic conveying.

Fans also can be furnished gas tight, rubber covered, or with vulnerable parts of stainless steel or Monel — in fact, *in any construction* your special needs demand.

Standard fan housings and side plates are cast iron, long wearing, long resisting to corrosion. Heavy steel plate wheels are perfectly balanced. Fans in each of the 6 sizes can be V-belt or direct motor driven.

TYPE O BLOWERS

Capacities to 30,000 CFM; Pressures to 35"



Another Clarage HEAVY-DUTY industrial fan! Use Type O Blowers for *high pressure* applications — supplying air to cupolas, gas and oil burners, etc. Fan housings and wheels are heavy steel plate equal to severest conditions. Built in 19 sizes, operating at speeds *most economical* for direct motor or steam turbine drive.

WE ALSO MAKE:

LARGE INDUSTRIAL FANS
AIR CONDITIONING EQUIPMENT
AIR WASHERS UNIT HEATERS

CLARAGE FAN COMPANY—*Kalamazoo, Michigan*

CLARAGE

—HEADQUARTERS for Air Handling and Conditioning Equipment

SEE OUR CATALOG IN SWEET'S

It pays to direct fan inquiries our way . . . phone Clarage office in your city, or write us at Kalamazoo.

Application Engineering Offices in All Principal Cities

WHAT'S NEW IN EQUIPMENT

Begins on page 146

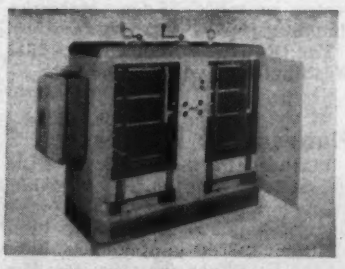
MAINTENANCE TOOLS & SUPPLIES

Triggerless Air Tool

Light weight and no-trigger construction make this pneumatic hammer safe and easy to handle. The tool measures 9½ inches over all, and weighs 5 lb. It operates when pressed into the work, stops when withdrawn.

You can use it conveniently for all-round applications such as chipping, trimming, riveting, etc. Objectionable recoil has been eliminated. Other features include force of blow control—adjustable from light tap to full power—and low air consumption. You can operate it on from 30 to 100 pounds pressure, depending on the work.

Burgess Thomas Co., Dept. R, Box 287, Bloomfield, N. J.



Selenium-Rectifier D.C. Welders

Dual 300/600 and 400/800 ampere selenium-rectifier d.c. welders provide two welding circuits in one common enclosure. Circuits may be used independently or in par-

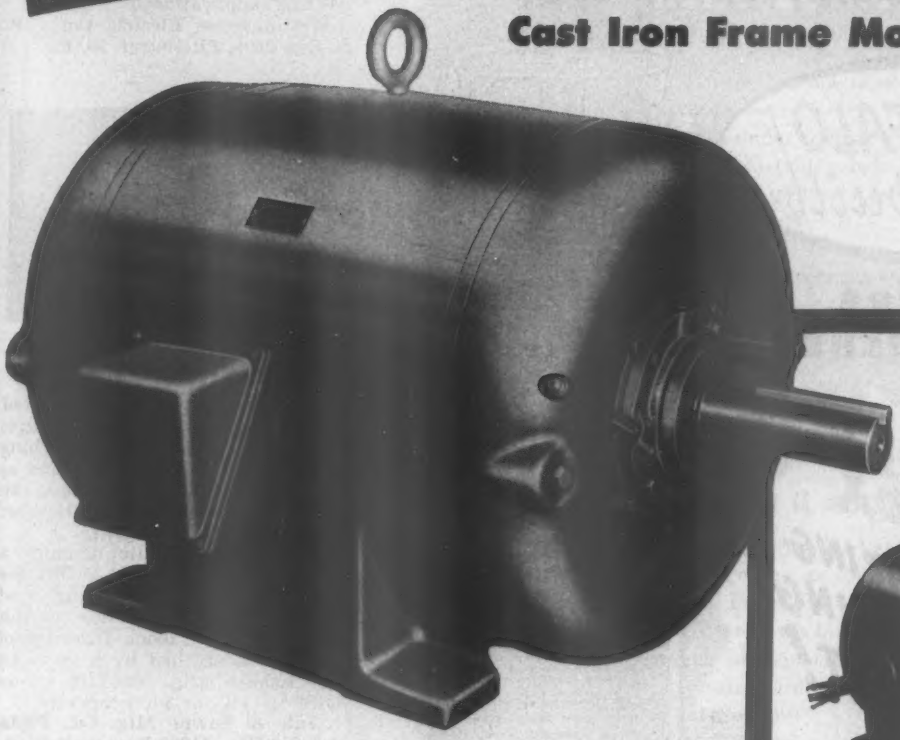
Wagner
ELECTRIC MOTORS
...the choice of leaders in industry

corrosion is no problem—

WHEN YOU USE

Wagner

Cast Iron Frame Motors



Rugged, one piece, corrosion-resistant, cast iron inner and outer frame, showing openings for ventilation.

They resist the damaging action of acids, fumes, moisture and other destructive elements

Wherever corrosion resistance is a "must" for motors—in chemical plants, oil fields, refineries, and industrial plants where tough operating conditions exist—Wagner Cast Iron Frame Motors are a sound choice.

They feature special varnish treated windings that resist acids and alkalies . . . a cast iron, gasket-sealed conduit box . . . and drain plugs in the endplates for easy removal of condensation from inside the motor. They are totally enclosed in rust and corrosion-resistant cast iron—even the nameplate is made of corrosion resistant material!

Wagner Cast Iron Frame Motors are available in ratings from 5 to 250 horsepower, in both standard totally-enclosed fan-cooled and explosion-proof designs.

Bulletins give full information on these, and other motors in Wagner's complete line. Thirty-one branch offices, located in principal cities, are ready to assist you in any motor application problem.

Wagner Electric Corporation
1891 WE 1951

WAGNER ELECTRIC CORPORATION
6412 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

NOW! AN IMPORTANT and EXCLUSIVE NEW IMPROVEMENT IN FIRE EXTINGUISHERS

BUFFALO better-built

VL FIRE EXTINGUISHERS with—

DRYEX THE AMAZING NEW DRYING AGENT!

Long proved for its speed and effectiveness in fighting fires of electric origin, also against fires in oils, gasoline, paint, greases and other flammable liquids, the Buffalo *better-built* VL Fire Extinguisher is now more dependable than ever! Each VL Extinguisher now contains DRYEX, the exclusive new drying agent that removes all traces of moisture, prevents corrosion and rust, insures continuous accuracy of performance and adds many years to the dependable life of the extinguisher.

1-qt. VL Fire Extinguisher containing DRYEX

Also available in 1½-qt., 1-gal. and 2-gal. sizes

WRITE US for full information on **DRYEX** and name of your nearest Buffalo distributor.

BUFFALO FIRE APPLIANCE CORPORATION
DAYTON 1, OHIO

Established 1895

allel to provide a single circuit of twice the capacity.

A clutch-and-sprocket and chain arrangement makes possible either independent or unit operation of the current control handles on each individual welder. Primary contactor facilitates use of these machines on automatic and stud welding applications.

Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

Combination Lift-Pull Chain Hoist

The Pul-Lift ratchet-operated chain hoist has a variety of uses in positioning, lifting, or stretching operations. Light in weight and as easy to operate as a wrench, it can readily be applied to any number of maintenance problems.

The ratchet handle actuates a lifting sprocket to pull or lift the load. Positive self-actuating load brake and ratchet action permit close spotting of loads. Direction of travel is controlled by a lever on the handle grip. Pul-Lift comes with ¾-, 1½-, or 3-ton capacity.

Yale & Towne Mfg. Co., Philadelphia Div., 11000 Roosevelt Blvd., Philadelphia 15.

Portable Arc Welder

Compact and completely portable for on-the-spot welding, the Model 125A electric arc welder has 16 heat stages ranging from 20 to 125 amp. It welds iron, steel, brass, bronze, and other metals with 1/16- to 5/32-in. electrodes.

Operating features claimed by maker are stable arc, improved method of cooling, positive control, and no moving parts to wear out. Equipment includes headshield, electrode holder, ground clamp, cables, and welding rods.

Trindl Products, Ltd., 17 E. 23 St., Chicago 16, Ill.

Thoriated Tungsten Welding Electrode

Thoriated tungsten electrodes for inert-gas-shielded arc welding are said to operate much cooler than standard tungsten rods and have high arc stability at low currents.

More on next page

when you use v-belts, remember...

VEELOS CUTS COSTS ON V-BELT INVENTORIES

This large stock of endless v-belts is as unnecessary as it is costly and hard to keep under control. Switch to Veelos—the adjustable v-belt—and stop forever all this useless waste of time, space and money.

when you use v-belts, remember...

VEELOS IN STOCK MEANS ANY SIZE BELT IS INSTANTLY AVAILABLE

Just four reels of Veelos can take care of as many as 316 sizes—*every* v-belt need in the O, A, B and C widths. No cluttered stockroom, no control problem, no replacement difficulties when you standardize on Veelos in the widths you require.

when you use v-belts, remember...

VEELOS KEEPS MACHINES AT PEAK PRODUCTION

Veelos runs true for vibrationless, full power delivery. Veelos installs *quickly* and *easily*—and you never need to dismantle outboard bearings. Veelos can be simply adjusted to maintain uniform tension on all belts.

And, as a reminder...

Write for your free copy of the Veelos Data Book and have all the facts on this adjustable v-belt at your fingertips.

VEELOS
THE LINK
V-BELT

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof, static conducting. Also double V in A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. Veelos is known as VEELINK outside the United States.

MANHEIM MANUFACTURING & BELTING COMPANY, MANHEIM, PA.

write for complete information!

when you think of
ENGINEERED
CONVEYING
SYSTEMS
the name to
remember is

ALVEY-FERGUSON
the original SINCE 1901

THE ALVEY-FERGUSON COMPANY, 131 DISNEY ST., CINCINNATI 9, OHIO
Offices or Representatives in Principal Cities

You Can *SEE* the Superiority of Alvey-Ferguson Conveyor Engineering

These features permit the use of higher currents on a given-size electrode and make touch-starting practical even at low currents.

Electrode consumption is negligible and contamination due to accidental or deliberate touching is eliminated. Electrodes may be pointed for continued operation at extremely low currents.

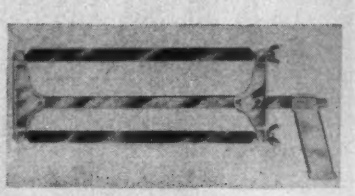
Air Reduction, 60 E. 42 St., New York 17.

Transformer Welder

The Airco Model MCX transformer welder covers a wide range of applications from light duty sheetmetal jobs to heavy duty industrial work. The unit has a full 200 amp., 50% duty cycle, NEMA rating. Three ranges provide infinite current adjustment from 30 to 250 amp. with 1/16 to 3/16-in. diameter electrodes.

Silicone insulation is water repellent and prevents high temperature breakdown. Welder has automatic hot start control and a gas-filled, time-delay magnetic switch that has no open contact.

Air Reduction Co., 60 E. 42 St., New York 17.



Two-Bladed Hack Saw Frame

The Duo-Kut Hack Saw Frame is really two saws in one. Finger tip control gives you a choice of either of two blades in any one of four cutting positions.

The steel frame accommodates two 10- or 12-in. blades. Blades are held rigid and straight by wingnut tighteners on square tension studs. To release the frame for turning, you simply press the release button on the handle.

E. C. Atkins & Co., Indianapolis, Ind.

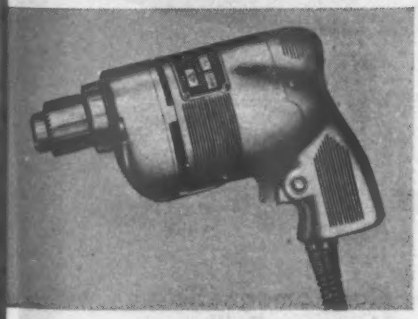
Portable Gas Torch

The Hauck people have a heavy-duty large-size portable gas torch that they have built for rugged, steady service. They say it brings a fast, clean heat right to your repair job—often avoiding the need for dismantling machinery and taking parts to the shop for forging. The unit operates with compressed air at 30 psi. or more, and burns natural, mixed, manu-

Difficult angle drilling on end castings for GASMACO's Automatic Time Cycle Control is made easy with a Model 45 SKIL Drill. (Model 80—½ inch Drill on bench.)

SKIL DRILLS

at GASMACO* do difficult angle jobs better . . . faster



MODEL 45 SKIL DRILL

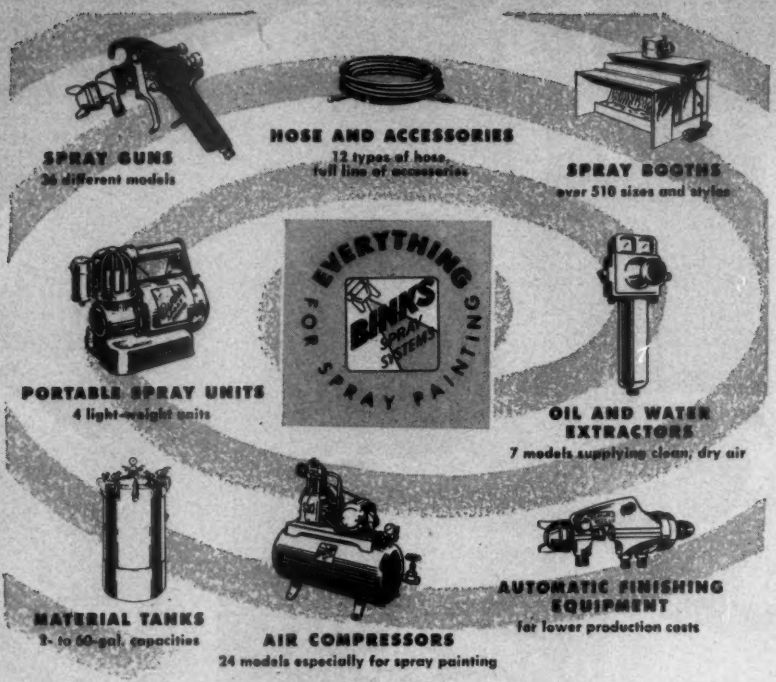
Powerful, compact ¼ inch Drill. Easy to handle—only 6⅝ inches long, weighs only 2½ lbs. Ask your SKIL Distributor to show you this Model 45 SKIL Drill.

Where shop efficiency requires the tool to come to the work, GASMACO does production jobs with portable SKIL Drills. In GASMACO's Cleveland plant, production workers prefer SKIL Drills for their light weight, easy handling; for their fast action in tough, heavy materials. In industrial plants everywhere, SKIL Drills stand up longer, need fewer repairs. It will pay you to standardize on SKIL Drills. Ask your SKIL Distributor about them today.

*GAS MACHINERY COMPANY
Cleveland, Ohio

SKIL

SKIL Products are made only by
SKILSAW, INC.
5033 Elston Ave., Chicago 30, Ill.
Factory Branches in Principal Cities
In Canada: SKILTOOLS, LTD.
66 Portland St., Toronto, Ont.



Binks has everything you need for better spray finishing

Wherever fine finishes are applied, you will find Binks precision made spray painting equipment... and for good reasons:

Lower costs—Binks equipment reduces rejects... gives you faster finishing.

Finer finishes—Binks spray guns are precision-made ...scientifically designed.

Everything from a single source—from spray guns to complete finishing departments.

Standardization—Binks equipment gives you increased flexibility because parts are interchangeable...all threads are standard.

Nationwide service—Whether you want replacement parts or repair in a rush, or expert counsel on lower cost methods of finishing, Binks is your finishing center.

"Repeat orders for Binks equipment are our best indication of performance." Burke B. Rich President

Send now for full information on the Binks line of finishing equipment.

Binks MANUFACTURING COMPANY

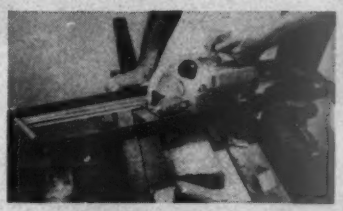
3114-34 West Carroll Ave., Chicago 12, Ill.

NEW YORK • DETROIT • LOS ANGELES • ATLANTA • BOSTON • CLEVELAND • DALLAS • MILWAUKEE • NASHVILLE
PHILADELPHIA • PITTSBURGH • ST. LOUIS • SAN FRANCISCO • SEATTLE • WINDSOR, ONTARIO, CANADA

factured, propane, or butane gas.

You can use for continuous or intermittent operation, indoors or outdoors in any weather. Largest of the five sizes available has a range of flame length from 10 to 48 inches, a heat release of 1,300,000 Btu./hr. Bulletin No. 1070 gives complete data.

Hauck Mfg. Co., 124 Tenth St., Brooklyn 15, N. Y.



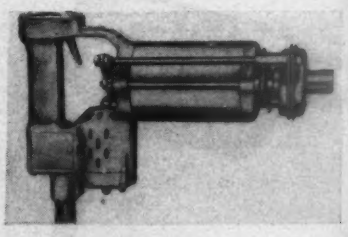
Portable Saw Guide

The Universal saw guide will add versatility to your portable electric saws. Crosscutting, mitering, beveling, and ripping can be performed quickly and precisely.

You clamp the attachment to the front member of a wooden miter box, and adjust the locking quadrant for the desired cut. Both crosscutting and ripping cradles have adjustable sidebars to accommodate the shoe of any standard saw from 6- to 12-in. size. Sidebars can be readily changed to permit more than one type of saw to be used on a single job.

For ripping operations you can invert saw to form a table saw complete with guide fence. All machine work on the saw guide is said to be of close tolerance to provide rigidity and repeatability of cut.

Universal Saw Guide, 1080AS Howard St., San Francisco, Calif.



Electromagnetic Hammer Drill

Automatic rotation of the drill in this electromagnetic hammer speeds up hole drilling in concrete, brick, and stone and eliminates operator fatigue induced by manual turning of the drill chuck. A rubber ratchet mechanism actuated by the recoil of each hammer blow does the trick. Its light weight (11¾ lb.) and automatic drill rotation suit it

NEW!

3

The new Norton-developed precision bushing is the latest step in the continuous Norton program to give you better grinding wheels—an important step in which was the opening of the new Norton grinding wheel plant two years ago.

1. IMPROVES WHEEL BALANCE

You get new standards of balance in every wheel produced in the new Norton plant. And the precision construction of this aluminum bushing preserves for you every bit of the improved balance molded into the wheel—thus bringing to you *all* the improved performance that comes from better wheel balance.

2. HAS MORE UNIFORM HOLE SIZE

This new Norton bushing gives you precision arbor fits because precision manufacture holds its hole size to closer tolerances than ever before achieved in any other grinding wheel bushing.

3. STRENGTHENS HOLDING POWER

The fluted construction on the outside of each Norton precision bushing *plus* the method of press-fitting it into the wheel give you double assurance of a firm grip, even in fine grit wheels.

AVAILABILITY—The new Norton precision bushing is now being used in straight wheels 5″ to 8″ diameter. Its use will be extended to other wheel shapes and sizes as rapidly as possible. Keep in touch with your Norton distributor for the latest news.

* PATENTED—ANOTHER EXCLUSIVE NORTON FEATURE

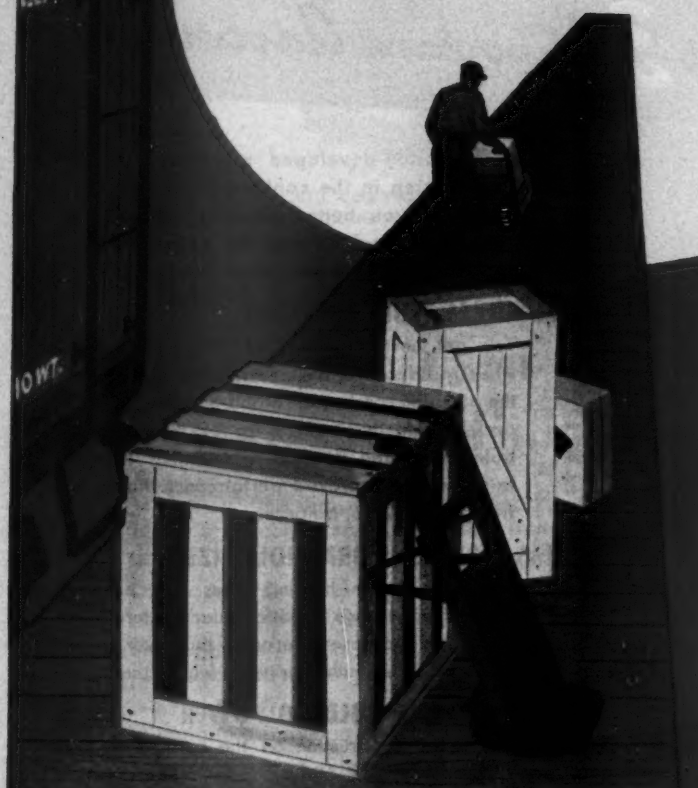
Making better products to make other products better

NORTON COMPANY, WORCESTER 6, MASS.

Warehouses in Five Cities — Plants in Six Countries
Distributors in All Principal Cities

NORTON

Plant managers need to know more about wood!



For your own protection

BUILD WITH *Penta*-PROTECTED WOOD

Wood is an extremely important industrial building material . . . for many jobs, the best you can use. It's easy to handle, has superior sound-absorbing qualities, and is comparatively cheap. Now you can get still more from your wood. Protect it with PENTA, the clean wood preservative.

PENTA adds years of life and strength to wood by protecting it against termites and rot. Its deep, penetrating action assures you of wood that lasts up to *four times longer* than untreated wood. You'll find that PENTA leaves wood clean and easy to work with.

Build with wood . . . build safely and surely with PENTA-PROTECTED wood.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

Send for free booklet
"Pointers on Penta"

The Dow Chemical Company
Dept. PE-1
Midland, Michigan

Name_____

Title_____

Company_____

Address_____

City_____ State_____

DOW
Penta
chlorophenol

for drilling holes in awkward locations.

Syntron Co., 480 Lexington Ave., Homer City, Pa.

Slitting Shears

Samson hand lever shears in five new models cut mild steel sheet or plate up to 5/16-in. thick. Shears up to 3/16-in. capacity are operated by toggle action; larger models have a geared-action cutting drive.

Shears are operated by a single down stroke of the lever. Offset frame enables machine to cut sheet or plate of any length or width. Holddowns can be adjusted to thickness of material being cut. Shears will handle flats and rounds as well as sheet steel.

Julius Blum & Co., 532 W. 22 St., New York 11.

Electric Spray Gun

This self-contained spray gun will handle a wide variety of liquids—paints, lacquers, light oils, and chemicals. You can use it for painting, rustproofing, deodorizing, stenciling, and a wide variety of applications.

The all-metal aluminum gun is lightweight, and simple to operate—just plug in to any 110-volt a.c. socket, press the trigger, and you are spraying. Easy to clean; it requires no special oiling or maintenance. No compressor is needed. Electric vibrator is said to provide an even, constant spray. Glass jar holds 25 oz.

Champion Implement Corp., 45 W. 45th St., New York 19.

More on next page

"Drive thy business—let not that drive thee."

—Ben Franklin's Almanac, 1757

These days thee must work a month for the taxgatherer before thee begins to work for thyself. Keep a firm hand on the wheel of savings to bolster thy "nett after taxes."

*—Acme Steel Notebook, 1950**

A business steered by the guideposts of thrift and efficiency seldom goes wrong. Helping business obtain greater thrift and improved efficiency has been the reason for Acme Steel methods and Acme Steel products for 70 years.

We are now helping more than 50,000 customers, including almost every industry, obtain these benefits, particularly in departments and operations concerned with packaging, shipping and materials handling.

For detailed information about Acme Steel products, write on your business letterhead for free booklets on the specific products in which you are interested.

Acme-Morrison Metal Stitchers aid increased production of gas ranges by speeding assembly of parts.

Metal-to-metal or metal-to-other materials—just stitch it like paper with Acme-Morrison metal stitchers.

ACME STEEL COMPANY

Dept. FM-11, 2838 Archer Avenue, Chicago 8, Illinois

There are 46 Acme Steel service offices in the U.S. and Canada.

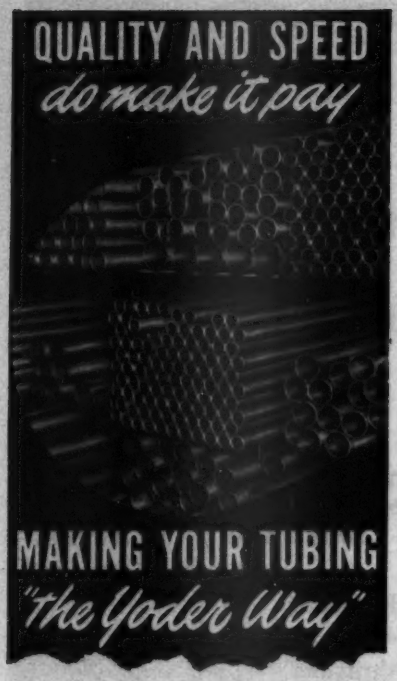
**The sagest maxims of Ben Franklin, together with modern parallels, appear in Acme Steel Notebook, 1950. We have a free copy for you. Just ask for it.*

ACME STEEL CO. CHICAGO

ACME STEEL

Who "owns" Acme Steel? Our 1949 annual report showed 7,538 stockholders—2,730 women, 2,705 men, 1,612 joint accounts and 491 corporations and institutions. Acme Steel stockholders have increased approximately 20 per cent in number in the past two years.

ACME STEELSTRAP flat steel strapping and ACME UNIT-LOAD carload bracing BAND, SEALS and TOOLS • ACME SILVERSTITCHER machines • ACME SILVERSTITCH stitching wire • ACME-MORRISON METAL STITCHERS and BOOK STITCHERS • ACME-CHAMPION BAG STITCHERS • ACME HOT AND COLD ROLLED STRIP STEEL • ACME GALVA-BOND steel slat stock for Venetian blinds • ACME STEEL SPECIALTIES, including hoops, corrugated fasteners, nail-on strapping and other container reinforcements • ACME STEEL ACCESSORIES—snips, cutters, punches, tool mounts, reel stands, coil holders, coil trays.



● The fine finish, cleanliness, light weight, strength and low cost of tubing made the Yoder way spell SALEABILITY, in big letters. That's why more and more manufacturers are constantly finding new uses for tubing in their product designs.

In a little over ten years, the products of Yoder tube mills have found their way to every country on the Globe, and Yoder tube mills, at home and abroad, turn out billions of feet every year, in sizes from ¼" up to 20" diameter.

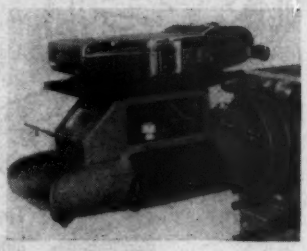
Low first cost, compactness, simplicity of operation and high production, are features of Yoder electric-weld tube mills which make the investment highly attractive. Because of multiplying uses, the market for tubing has been and still is expanding more rapidly than the supply. A surprisingly large number of operators, since installing their first Yoder mill, have added others. 34 owners now operate a total of 90 Yoder mills.

Whether you contemplate making pipe or tubing for resale or for your own use, send for 68-page Book of information on the mechanics as well as the economics of making it "the Yoder Way". Consultations and Estimates without obligation on your part . . .

THE YODER COMPANY
5513 Walworth Avenue • Cleveland 2, Ohio

COLD FORMING
YODER
SLITTING AND
TUBE MILL MACHINERY

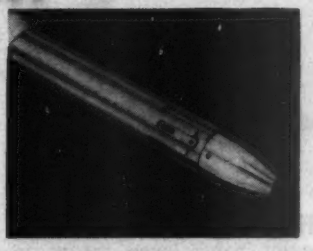
MEASURING & CONTROL



'Scope Camera

You can have an on-the-spot record of an oscilloscope image in one minute's time. A Du Mont oscilloscope-record camera does the trick. It uses the publicized Polaroid-Land process to deliver a finished 2¼x3¼ print at the completion of each exposure. Camera fits any standard 5-in. cathode-ray oscilloscope.

Du Mont Laboratories, 1000 Main Ave., Clifton, N. J.



Air Gage Plug

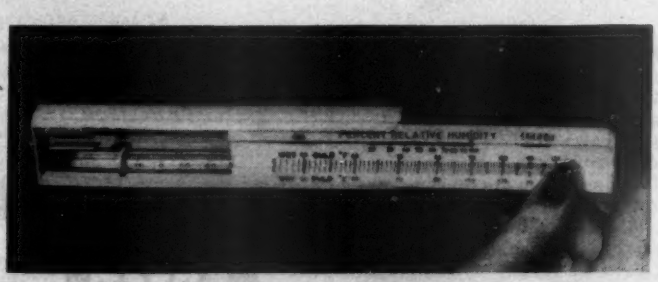
Air gaging plugs on the Air-O-Limit comparator use contact buttons to gage diameters of rough-surfaced bores more accurately. Buttons are depressed by contact with the work, impeding the escape of air from nozzles. Resultant change in line pressure is a measure of variation of diameter from standard.

Niles-Bement-Pond Co., West Hartford 1, Conn.

Humidity Recorder-Controller

The high sensitivity of its gold-leaf sensing element gives the new Minneapolis-Honeywell hygrometer close control over plant or process humidity. System records and controls relative humidity in the 20-93% range to a calibrated accuracy of 1%. Operation over distances up to 1000 ft. makes possible centralized control from a supervisory panel. Maintenance is minimized by air filtration and elimination of psychrometric accessories.

Minneapolis-Honeywell Regulator Co., 4494 Wayne Ave., Philadelphia 44.



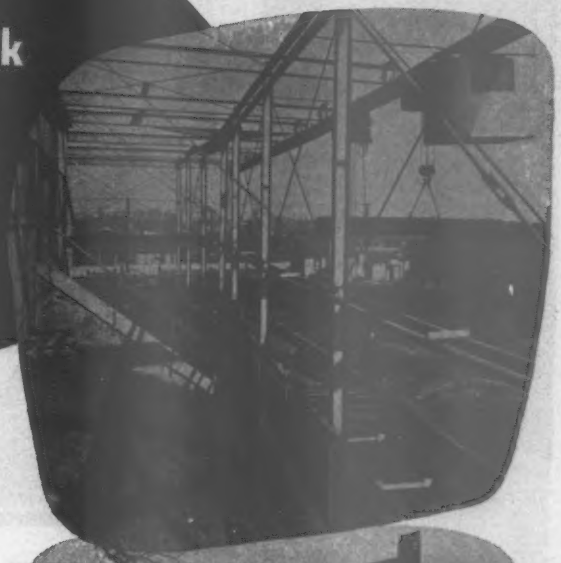
Pocket-Size Humidity Indicator

You can check temperature and humidity quickly with this handy indicator. The two thermometers work on the wet- and dry-bulb principle. You fan the instrument to get a wet-bulb reading. Then, setting both wet- and dry-bulb temperatures on the slide calculator, you read relative humidity directly.

Weston Electrical Instrument Corp. Tagliabue Instrument Div., 614 Frelinghuysen Ave., Newark 5, N.J.

More on next page

15 Tons of Bar Stock Unloaded and Stored in 30 Minutes



It takes only 30 minutes, with 3 men, to unload 15 tons of bar stock from trailer to storage yard with this 5-ton American MonoRail crane. An average of 27 tons per day from storage yard to processing is a smooth continuing operation day after day.

This is the easiest and best way to handle bar and sheet stock because American MonoRail Overhead Handling Equipment increases production, saves labor, saves time, and cuts costs.

American MonoRail engineers will gladly show you how automatic handling pays and saves. Write today — ask for Bulletin C-1.

THE AMERICAN **MONORAIL** COMPANY

13114 ATHENS AVENUE CLEVELAND 7, OHIO

Whiteman

Power Buggy

A MINIATURE DUMP TRUCK
NOT A FORK LIFT

HAULS BAGS, BOXES OR BULK—FASTER BETTER—CHEAPER!

INTERCHANGEABLE STAKE-TYPE BODY

More and more industrial plants are finding the Whiteman Power Buggy just the thing for hauling raw materials, parts, crates, cartons and refuse within the plant and out. Does the work of six men with hand trucks. Bucket-type body has positive-control dumping mechanism and is easily interchanged with stake body in a few minutes. Of sturdy construction, will go anywhere—up 25% grades, through narrow doorways, into boxcars. Turns on own radius. One ton capacity, yet weighs only 695 lbs. Heavy duty 7.5 hp 4 cycle air-cooled engine. 16 mph. Automatic speed changer. Proved in use for many years by leading firms. Top quality throughout, yet priced far below any comparable equipment. Soon pays for itself. Send coupon for details today!

SEND FOR DETAILS NOW!

WORKING HARD

for these satisfied users

WHITEMAN MANUFACTURING CO.
3249 Casitas Ave., Dept. F
Los Angeles 39, Calif.

Please send complete information and prices on the Whiteman Power Buggy and name of my nearest distributor.

Name_____

Firm_____

Address_____

City_____ State_____

NEW MEASURING & CONTROL APPARATUS

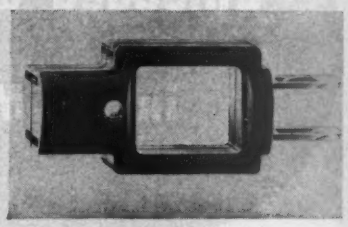
Begins on page 184

Conveyor Line Monitor

When you attach a Photoswitch Set P1D to lines carrying cases or cartons, you hire a photoelectric eye to look out for the formation of conveyor bottlenecks. This device reacts to the presence of a jam by stopping conveyor or introducing corrective measures.

The delayed-action timer permits an electronic control circuit to function when trouble starts to build up. The system operates only when the light beam remains interrupted for a preset time interval—a period of time longer than that normally required for a case to pass. Delaying action can be set anywhere between 1/20 and 5 seconds.

Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.



Plug Attachment for Snap-On Volt-Ammeter

The Amprobe split plug facilitates snap-on current readings of equipment having sealed double-conductor electric cord. When plugged in between the equipment to be checked and its outlet, it separates the conductors, permitting the jaws of a snap-on meter to pass in between. Capacity is 30 amp., for intermittent use, 15 amp. for continuous use.

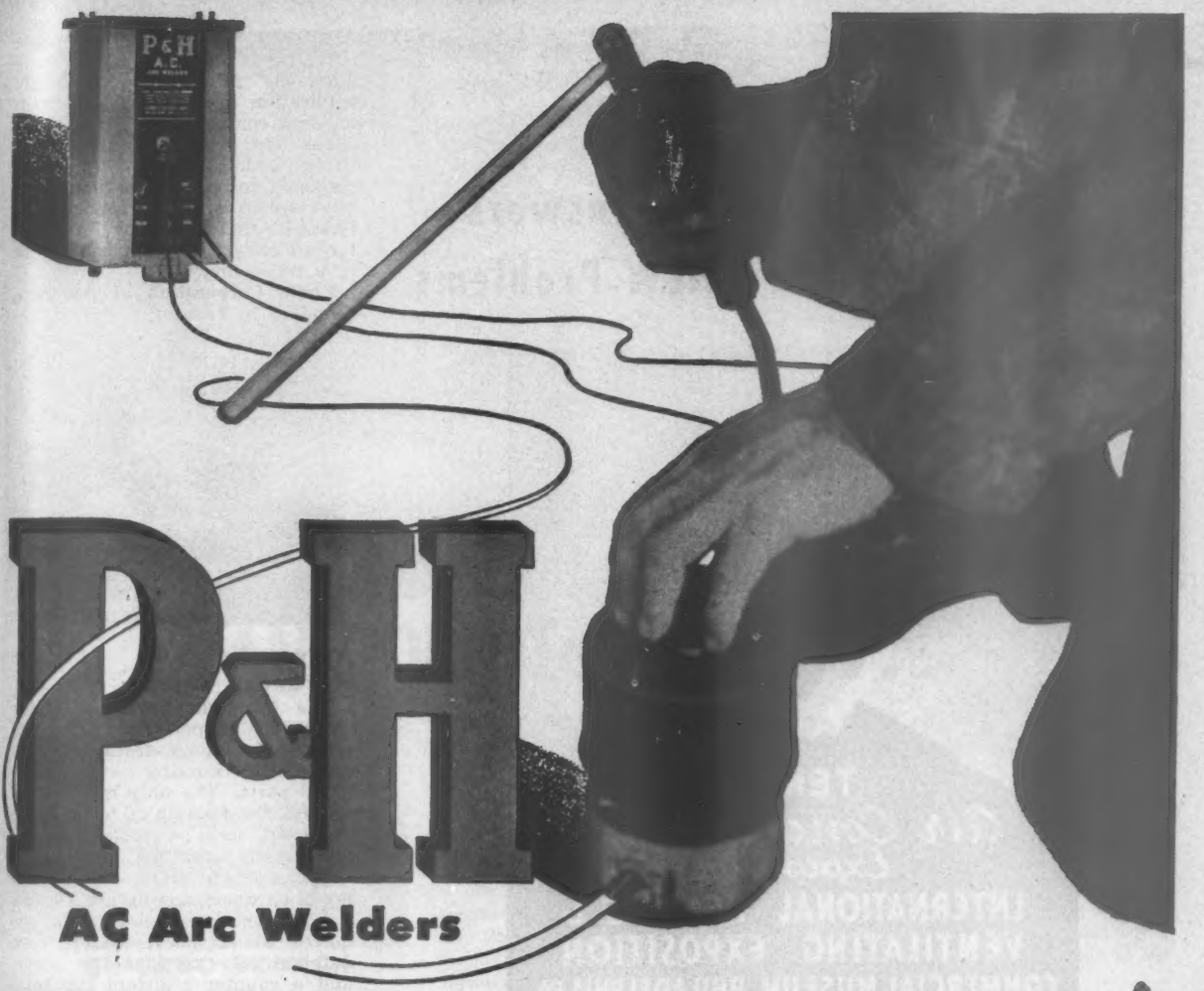
The Amprobe 10x Sensitizer, of similar construction, increases meter sensitivity for low current readings. Particularly suited for measurements on fractional horsepower motors, this unit multiplies current readings by a factor of 10. Capacity is 10 amp. for intermittent use, 2½ amp. for continuous service.

Pyramid Instrument Corp., 49 Howard St., New York 13.

7-Inch Oscilloscope

RCA has engineered its WO-56A cathode-ray oscilloscope to meet the need for a high-quality instrument with the advantages of large screen size and portability. Its compactness and convenience of oper-

More on next page



P&H

AC Arc Welders

Turn the heat on – at the work!

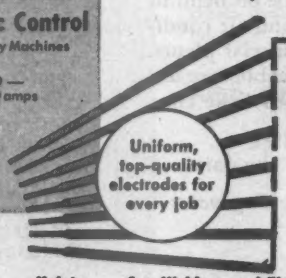
Exclusive Dial-lectric control saves time and motion, cuts your welding costs

P&H built-in remote control puts heat selection just where your operators want it — at the work. Walking time is turned into welding time. Mount the welder on the wall—save valuable floor space. Welding is faster, sounder, better looking. Production goes up, costs go down.

Additional features are: Easy quick-start arc. Elimination of arc blow. No moving parts to cause delays or maintenance expense. High electrical efficiency that reduces power costs. NEMA rated.

See your P&H representative or distributor for full details.

Model TH-500 — Range 40 to 650 amps
Model TH-300 — Range 30 to 400 amps
The only Complete Line of AC Welders with Dial-lectric Control
Also complete line of High-Frequency Machines
Model TI-200 — Range 30 to 275 amps
Model TI-150 — Range 20 to 190 amps



TEAR OUT THIS COUPON AND MAIL TODAY

P&H WELDING DIVISION
4525 W. National Ave.
Milwaukee 14, Wisconsin
HARNISCHFEGER CORPORATION
MILWAUKEE 46, WISCONSIN, U.S.A.

Please, send me additional information showing how P&H AC welders cut welding costs.

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Company.....Title.....
Address..... ☐ Home ☐ Business
City.....(...) State.....

Excavators • Overhead Cranes • Hoists • Arc Welders and Electrodes • Soil Stabilizer • Crawler and Truck Cranes • Diesel Engines
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LOOK HERE for Answers to Tomorrow's NEW Problems

Now that priorities, allocations, cut-backs, and other essential restrictions have returned to the industrial scene, the heating, ventilating, and air-conditioning picture is certain to undergo significant changes in the days to come—to pose new problems for plant owners, managers, operators, architects, and engineers. That is why attendance at this foremost Exposition of its kind—largest ever staged—takes on greater importance and timeliness than ever. The wealth of first-hand information available here on latest developments, newest trends, available equipment and supplies, and sources of supply, may prove to be an invaluable business asset for the uncertain times ahead.

Over 300 exhibitors with their technical respresentatives will be on hand to show and tell what the future offers for heating, ventilating and air conditioning in all types of commercial and public buildings, industrial plants, and homes. In no other way can so many helpful ideas and valuable contacts be obtained, and so much equipment seen and compared in so little time . . . all so essential to solving tomorrow's new problems.

So plan now to take advantage of this big opportunity. Note the dates.

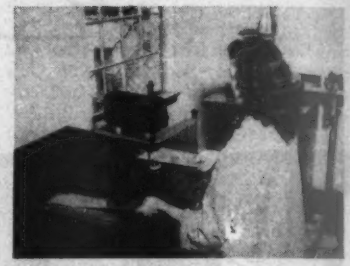
Auspices of the American Society of Heating & Ventilating Engineers

Management International
Exposition Company

ation are said to give it wide application in plant trouble-shooting and control.

The 7-in. scope has high sensitivity, good high-low frequency response, and concentric coarse and fine controls for ease in adjustment. Shielded input reduces hum distortion caused by plant equipment to a minimum.

Radio Corporation of America, Camden, N. J.



Automatic Hardness Tester

The Topflight hardness tester automatically performs three inspection functions—testing, certification, and counting — on sheet-metal parts. The only manual operation, the feeding of parts to be inspected, can be performed efficiently by unskilled workers.

The machine gives a dial reading of hardness, and flashes a green light if the piece meets the required standard. A stamp then automatically certifies the piece, and a counter registers the total number of pieces that pass inspection. If the work does not meet the required hardness, light, stamping die, and counter do not function.

Topflight Tool Co., Inc., York, Pa.

50-Foot Steel Tape With Automatic Rewind

Simple thumb pressure on the center plate-button rewinds the Longboy 50-ft. steel tape—the only steel tape, its maker says, of similar length with an automatic rewind. You'll find that you will get longer life out of Longboy, since workers are not so likely to let it lie uncoiled in industrial areas between measurements. It takes only 10 seconds to rewind the full 50 feet.

The tape rewinds with a constant torque, regardless of the length out. Pressure release stops rewind instantly. Tape is under full one-hand control at all times. Steel tape, ⅜-in. wide, weighs 23 oz., is nickel plated for protection.

Master Rule Mfg. Co., Inc., Middletown, N. Y.

More on next page

VAN DORN Tool Users . . .

FACTORY SERVICE Always NEARBY for You!

CHICAGO BRANCH

ATLANTA BRANCH

29 VAN DORN BRANCHES WITHIN 24 HOURS OF ANY CUSTOMER

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Dallas, Texas	Pittsburgh, Pa.
Denver, Colo.	Portland, Ore.
Detroit, Mich.	St. Louis, Mo.
Houston, Texas	San Francisco, Calif.
Indianapolis, Ind.	Seattle, Wash.
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Van Dorn's low-cost, guaranteed "Factory Service" helps you get maximum productive life out of every Van Dorn Tool you own! These Factory Service Branches are Company-owned and operated, not merely local repair shops "licensed" by a manufacturer. You deal directly with Van Dorn, enjoy all the advantages of our famous service policy and guarantee.

We're constantly expanding the number of these Branches and increasing their facilities to bring better service closer to more customers. In the *past year* we have built our own new Branches in Chicago, Atlanta and Toronto. We are building other new Branches in Buffalo, Boston and Philadelphia. And our Indianapolis, Houston, Denver, Seattle, Portland, St. Louis and Minneapolis branches have recently moved into new *larger* quarters designed especially for our use. If and when you need repairs on a Van Dorn Tool, use the Service Branch nearest you and save time, trouble and money! THE VAN DORN ELECTRIC TOOL CO., 719 Joppa Road, Towson 4, Maryland.

. . . And Each Service Branch is

. . . manned by expert mechanics trained in our own factory at Towson, Maryland.

. . . equipped with special electric tool servicing equipment for finer repair work.

. . . stocked with genuine Van Dorn replacement parts for trouble-free running.

FOR POWER SPECIFY "Van Dorn" PORTABLE ELECTRIC TOOLS

(Div. of Black & Decker Mfg. Co.)

Kester Solder

Kester engineers, with over 100,000 different types and sizes of solder available, will specify the right flux-core solder that will give maximum efficiency and economy to the job.

Easier to Use

Using the most suitable solder for each operation will enable solderers to work at top speed without sacrificing quality. Waste is eliminated and rejects are held to a minimum.

Top Quality

Kester Solders are made only from newly mined grade A tin and virgin lead. Fluxes—chemically and scientifically correct.

KESTER SOLDER COMPANY
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Newark, New Jersey • Brantford, Canada

Send for free manual, "SOLDER and Soldering Technique."

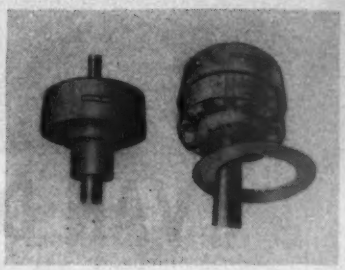
KESTER SOLDER

Standard for Industry since 1899

WHAT'S NEW IN EQUIPMENT

Begins on page 146

MECHANICAL POWER TRANSMISSION

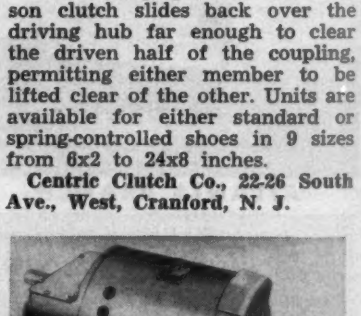


Telescoping Clutch Coupling

The Rawson centrifugal clutch coupling telescopes to permit vertical lift from its mounting of either driver or driven machine without disturbing either member. You may need this coupling for dual drives to pumps, fans, generators, etc., wherever moving heavy equipment is a problem or space restrictions make coupling assembly and disassembly impossible.

The driving spider of the Rawson clutch slides back over the driving hub far enough to clear the driven half of the coupling, permitting either member to be lifted clear of the other. Units are available for either standard or spring-controlled shoes in 9 sizes from 6x2 to 24x8 inches.

Centric Clutch Co., 22-26 South Ave., West, Cranford, N. J.



Reversing Magnetic Clutch

The latest magnetic clutch has a gearing arrangement to permit the output shaft to rotate in either

*UNIFORMITY

Under all conditions the proved performance of Tycol lubricants more than meets their recommended service.

Rigidly controlled and tested during manufacture . . . and refined from the highest grade crudes, Tycol oils and greases are known for their *UNIFORMITY within each classification — from the first drum to the last.

This unvarying high quality, plus the scope of the line, accounts for Tycol's wide acceptance by industry interested in maximum production . . . top efficiency . . . lowest operating cost.

Whatever your lubrication need, let a Tide Water Associated engineer help you select the one suited for your particular need. Call, write or wire your nearest Tide Water Associated office for full details.

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*LEARN WHAT THIS PRODUCT CHARACTERISTIC MEANS TO YOU — READ "LUBRICANIA"

This informative handbook, "Tide Water Associated Lubricania," gives clear, concise descriptions of the basic tests used to determine important properties of oils and greases. For your free copy, write to Tide Water Associated Oil Company, 17 Battery Place, New York 4, N. Y.

REFINERS AND MARKETERS OF VEEDOL — THE WORLD'S MOST FAMOUS MOTOR OIL

You know how to operate this extinguisher JUST BY LOOKING AT IT!

The *first 10 to 30 seconds* can mean the difference between *no loss* and *complete destruction* when fire starts. That's why Randolph's simple, *obvious* operation is so important in stopping fires *before* they spread!

Anybody can get a Randolph into action FAST! No valves to turn, no nozzles to adjust; just point and press your thumb! Randolph's snowy CO_2 is non-damaging, evaporates without a trace. It's non-toxic, won't conduct electricity, deteriorate or freeze. Underwriters' Approved.

A COMPLETE LINE OF CARBON DIOXIDE EXTINGUISHERS AND AUTOMATIC SYSTEMS

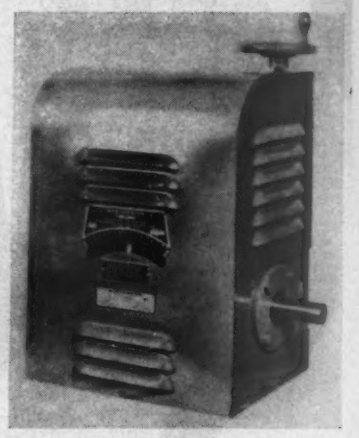
Learn how Randolph gives your plant better *preventive* fire protection! Write Randolph Laboratories, Inc., 4 East Kinzie St., Chicago 11, Illinois.

Randolph
SIMPLIFIED FIRE EQUIPMENT

direction with a unidirectional input. This reversing or two-speed Magneclutch is similar to the basic magnetic clutch, utilizing a dry magnetic torque medium. It is electrically operated and readily adapted to remote control.

Two excitation coils are driven in opposite directions. Reversal of the direction of rotation of the output shaft is accomplished by energizing one or the other of the excitation coils. The gearing does not impose the same speed ratio on both forward and reverse speeds. For machine tools, as an example, you can have a suitable cutting speed in one direction, and a much faster return travel.

Vickers Electric Div., Vickers, Inc., 1815 Locust St., St. Louis 3.



Tandem-Belt, Variable Speed Transmission

Tandem belt design suits the Allspeed drive to applications where space limitations require extreme compactness. An Allspeed unit provides a full range of speed variation—with smooth and rapid speed change—applicable to many types of production equipment. Speed is varied without stopping machine operation.

Units can be direct connected to any standard motor or may be driven by V-belt, flat belt, chain, or gears. Features include, in-line shafts, ability to change belts without disconnecting unit from other equipment, and life-lubricated ball bearings.

Six models, rated at 1, 3, 5, 7½, 10, and 15 hp., have speed variations of 16, 10, 9, 8, 6, and 6 to 1 respectively. Units are furnished to meet specifications for vertical or horizontal operation, to run in either direction. Handwheel control is standard, electrical remote controls optional.

Worthington Pump & Machinery Corp., Allspeed Drive Div., Holyoke, Mass. *More on next page*

Two of several wool bins in the Hardwick and Magee Spinning Mill—built with K&M APAC.

ON GUARD: K&M "Century"® APAC

When raw wool or processed wool is stored in bulk, there's danger of fire—not only from external causes, but also from spontaneous combustion. That's one of the reasons the Hardwick and Magee Company, nationally known carpet and rug manufacturers, chose K&M APAC for the construction of these wool bins in their modern spinning mill.

K&M APAC—specially processed sheets of asbestos-cement—resists fire effectively and dependably. The smooth, hard finish of APAC prevents fibrous matter and dust from adhering to the surface—reduces materially the opportunity for fire to spread. And K&M APAC stops the other enemies of raw materials, also—weather, rust, rot, termites, and rodents can't affect it.

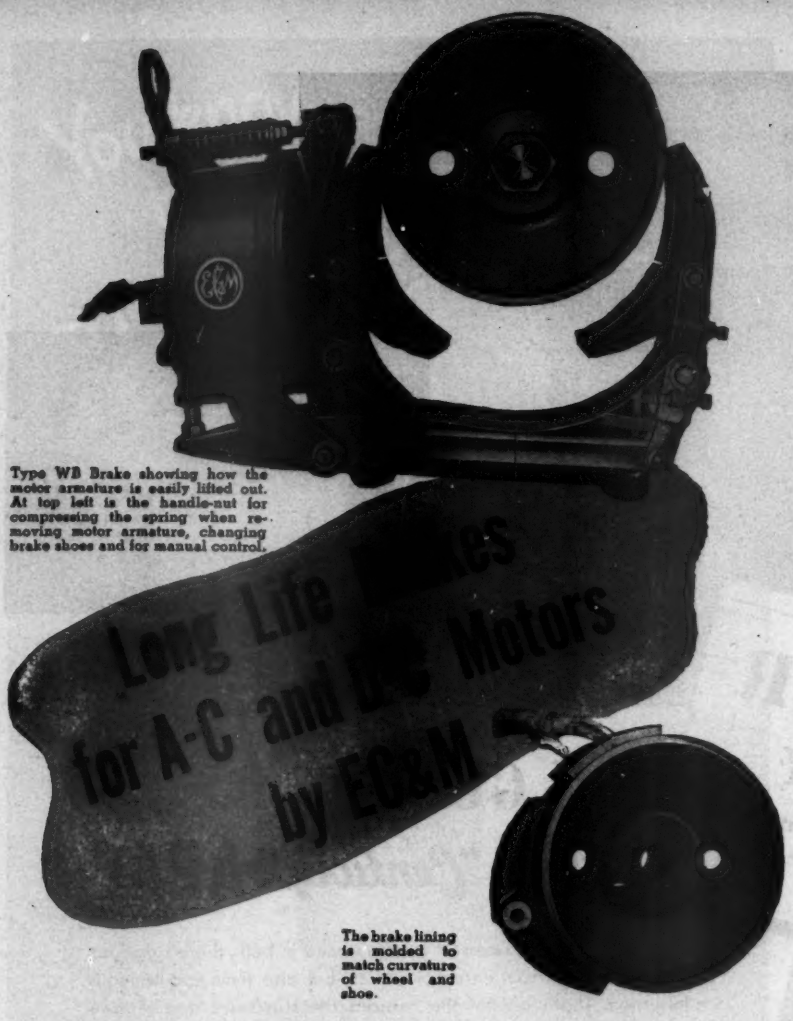
You'll like the installation economies you get from using K&M APAC, too. Sheet sections are large (4′ x 8′) and strong, but not bulky; they handle easily, can be cut and fitted on the job, are quickly erected. And you save on maintenance costs, too, for K&M APAC doesn't need even paint to preserve its attractive finish.

It will pay you to consider K&M APAC Asbestos-Cement Sheets for such needs as panels, partitions, sheathing, shaft casings, bins, in fact, for all flat surfaces both interior and exterior. APAC can be applied over insulation boards, wood studs, solid wood sheathing, steel or wood girts. It's adaptable and economical—the perfect answer to flat surface covering problems.

GET THE COMPLETE STORY—write us for details and the name of your nearest distributor. There's no obligation, of course.

Nature made Asbestos . . . Keasbey & Mattison has made it serve mankind since 1873

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA



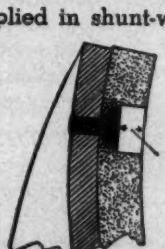
Type WB Brake showing how the motor armature is easily lifted out. At top left is the handle-nut for compressing the spring when removing motor armature, changing brake shoes and for manual control.

The brake lining is molded to match curvature of wheel and shoe.

These Type WB Brakes for a.c. and d.c. service have a block type lining which is both thick and tough.

Furthermore, due to the process of manufacture, the blocks have proper frictional quality *throughout the entire thickness* permitting uniform and complete wear down to rivet heads. And since the material is non-compressionable, brake adjustments are infrequent.

EC&M Type WB Brakes are built in several sizes. They can be supplied with series or shunt-wound operating coils for direct current motors. On alternating current service, they are supplied in shunt-wound form for use with a compact rectifier-unit. Send for Bulletins 1004 and 1006 describing these long life brakes.

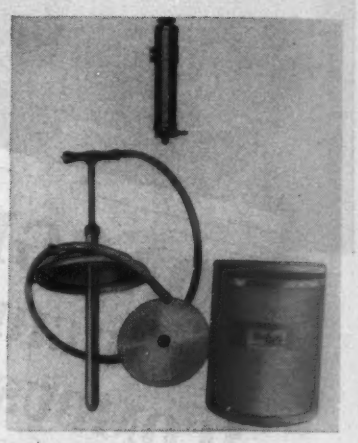


Actual wearing thickness, between rivet heads and brake wheel, is 1/8" on the smallest size to 1/2" on the largest size.

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79th STREET • CLEVELAND 4, OHIO

Begins on page 146

PLANT HOUSEKEEPING & SANITATION



Waterless Hand Cleanser

Kalene, a waterless hand cleanser, requires no plumbing to install, uses no inflammable cleaners. It is a profitable investment in worker morale. Simple dispensers may be installed in the most convenient locations on the job. The smooth cream removes grease, paint, tar, and other stubborn stains, and is said to condition and protect the hands as it cleans.

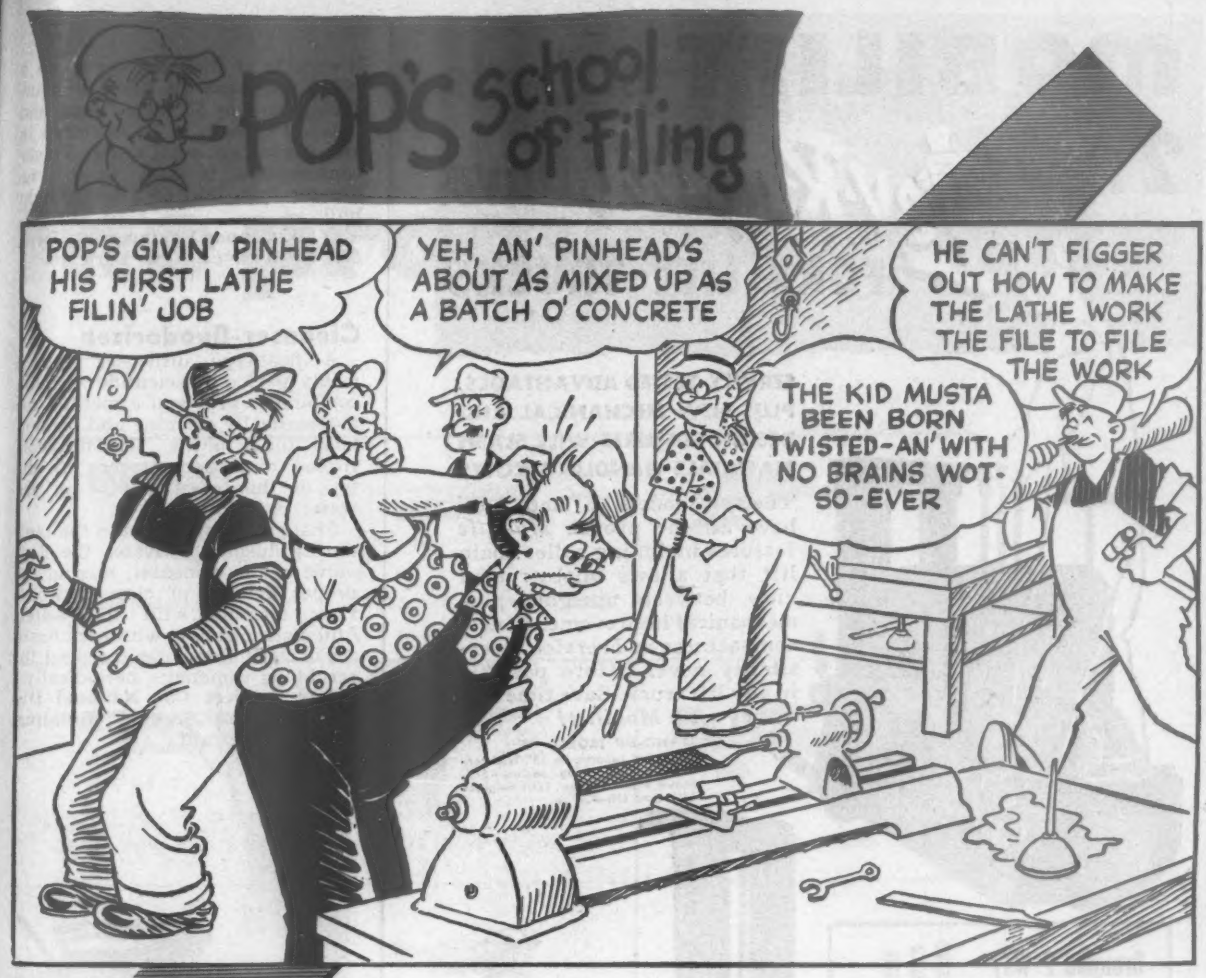
You simply rub it on, wipe it off, and dirt, grease, and grime disappear. The complete Kalene system includes wall dispenser, 50-lb. drum of cleanser, dispenser filler pump, and swivel wheel dolly for moving cleanser drum.

Kalene Corp., 706 Portland Ave., Minneapolis, Minn.

Air Freshener

A compact air purifier, called Air Improver, may be the answer in conditioning your lavatories, or any close space where proper ventilation may be lacking. The unit continuously draws room air through two canisters of activated carbon to remove odors and impurities.

The quiet 3000-rpm. motor blower


POP'S school of Filing
POP'S GIVIN' PINHEAD HIS FIRST LATHE FILIN' JOB
YEH, AN' PINHEAD'S ABOUT AS MIXED UP AS A BATCH O' CONCRETE
HE CAN'T FIGGER OUT HOW TO MAKE THE LATHE WORK THE FILE TO FILE THE WORK
THE KID MUSTA BEEN BORN TWISTED-AN' WITH NO BRAINS WOT-SO-EVER

THE lathe rotates the work and not the file, of course—as anybody but Pinhead would know. But not every lathe mechanic knows of the existence of a special Nicholson file that works very fast and does a beautiful job of smooth-finishing on spindles, shafts, dowel pins, hubs, gears, rolls — anything, in fact, that can be set up and spun in a lathe.

It's the Nicholson Long Angle Lathe File (also made in Black Diamond brand). Though a regular Mill Bastard will do a good job and is a bit easier to use, this special file, with teeth angle increased from 25° to 45°, has less tendency to fill up. The chips slide down the longer angle and are forced out at the edge by the "forward" motion of both the file and the work. Consequently, there is less chance of chip-scratches on the surface being smoothed. (A stroking action, under light pressure, should be used to distribute the cutting throughout the file.)

Made in Flat type with "Long Angle" stamped on tang; and sold through industrial supply houses. Unsurpassed Nicholson quality, of course.

FREE TECHNICAL BOOKLET, ***"10 Special File Types."*** Also, *"File Filosophy,"* Nicholson's famous 48-page illustrated book on kinds, use and care of files. *Free* — as many copies as you need for purchasing and production heads and key mechanics.

NICHOLSON FILE CO. • 27 ACORN STREET • PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

NICHOLSON FILES FOR EVERY PURPOSE

MOBILIFT presents
2 New Lev-R-Matic Drive
FORK LIFT TRUCKS

SERVICE-TESTED ADVANTAGES, PLUS NEW MECHANICAL AND DESIGN FEATURES WILL SLASH MATERIALS HANDLING COSTS

The new models "E" and "ER" have all the proven *Mobilift* features including roller chain lift that allows unobstructed view between uprights plus mechanical improvements, new compactness and service accessibility never before possible in any lift truck. Save time and money with *Mobilift!*

STAND-UP MODEL "E": 2,000 lbs. capacity on 15" load center; outside turning radius—57". Shown with 63" mast. (Lift Height—68"; Free Lift—37".)

Grouped 2-Way Levers Perform All Jobs

Lev-R-Matic Controls...

secret of speed, ease of operation and maneuverability...PUSH or PULL a single lever to go forward or back...a multiple-disc clutch smoothly transmits positive power instantly.

Roller chain lift and hydraulic tilt mechanism are activated by functionally placed 2-way levers.

NO GEARS TO SHIFT!

Write Today!

Get all the specifications and cost-slashing MOBILIFT advantages in the new "E" series Lev-R-Matic Bulletin.

SIT-DOWN MODEL "ER": 2,000 lbs. capacity on 15" load center; outside turning radius—63"; shown with 63" mast. (Lift Height—108"; Free Lift—37".)

MOBILIFT Lev-R-Matic DRIVE

MOBILIFT CORPORATION

933 S.E. MAIN STREET • PORTLAND 14, OREGON
2337 W. 19th, CHICAGO • 790 Paterson Ave., E. RUTHERFORD, N. J.
1113 Spring St. N. W., ATLANTA • 2236 Taylor St., DALLAS
2730 San Pablo Ave., BERKELEY • 6660 S. 26th St., LOS ANGELES

is capable of changing the air in a 1000-cu. ft. room 3½ times an hour. Unit measures 18 inches long and is small enough to be mounted in any convenient wall space. Power consumption is said to be no greater than that of a small light bulb.

W. B. Connor Engineering Corp., 500 Fifth Ave., New York 18.

Cleanser-Deodorizer

A float-type dispenser and a newly perfected scientific formula combine to give you a method for automatically cleaning and deodorizing toilet bowls. The float-controlled dispenser attaches to the top of the overflow pipe in the water closet.

Change of water level in the tank during flushing activates the float valve of the dispenser, mixing the proper amount of cleanser-deodorizer formula with the water. Automatic cleaning with each flushing of toilet eliminates the need for scrubbing commodes periodically.

Ray Sanders Co., National Distributors, 220 Security Building, Pasadena 1, Calif.

Pedal-Operated Toilet Flush

Since many people are psychologically averse to touching a toilet flush handle, these valves are likely to take quite a kicking around. You can build better employee relations, promote a more sanitary lavatory, and cut down on toilet valve maintenance, by installing the wall-type Easy Flush pedals.

The pedals will fit flushometer-type water-closets on both existing and new installations. Units are finished with polished chromium plating on heavy-gage brass, and stainless steel spring.

Approved Products Co., 205 E. 42 St., New York 17.

More on next page

designed for the production line

CP-806 Midget ¼" Drill

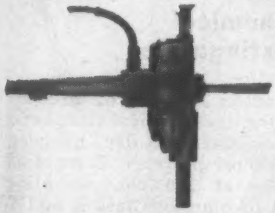
CP-816 Drill with Angle Head

CP-951 Heavy Duty Angle Sander

CP-846 Heavy Duty Drill

CP-935 Heavy Duty ½" Drill

CP-970 Grinder



CP-991 Heavy Duty 1¼" Drill

CP-815 ¼" Tapper

CP-800 Screwdriver

CP-866 Screwdriver—Nut Runner

CP-866 Angle Nut Runner

CP-930 Electric Hammer

With CP UNIVERSAL ELECTRIC TOOLS you can count on the same dependability, ruggedness and low maintenance that have built so outstanding a reputation for other CP products. Yet they are priced no higher than other production line tools because they are sold direct to the user by Chicago Pneumatic, the only major company selling electric tools directly to industry.

Write for Catalog 899-S

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

WASTE!

Waste—whether of materials or time—is a still bigger problem when allocations and restrictions gnaw into material and manpower availability.

Individually and as a group, the big three of efficient manufacturing: Production Control—Quality Control—and Material Control dictate the amount of waste to be coped with by any company. Within these three 'controls,' the cohesion brought about by proper planning and execution is vital. An important facet of this cohesion is proper communication.

TelAutograph telescribers continue to perform an outstanding part of well-planned manufacturing. Handwritten telescriber message communication between departments and plants assures immediate "delivery" of the message, simultaneous arrival of the message at all points and absolute accuracy. All messages are received in the same handwriting as the original transmission.

For detailed information on the use of TelAutograph Telescriber Systems in your plant write to Department B-1.

TelAutograph CORPORATION
16 West 61st Street, New York 23, New York
"Handwritten Messages Deliver Themselves . . . While You Write"

WHAT'S NEW IN EQUIPMENT
Begins on page 146

SAFETY & PLANT PROTECTION

Dry Chemical Fire Extinguisher

The Alfco Model 350 wheeled engine packs 350 lb. of fire extinguishing dry chemical compound and a cylinder of dry nitrogen under 2000 psi. pressure. Compound discharges at 200 psi. operating pressure to blanket Class B and C fires of considerable proportions.

The engine consists of nitrogen and compound cylinders and a 50-ft. hose mounted on a 2-wheeled chassis. Two men can pull it to the scene of the fire. Sustained pressurized discharge and a stream range of 20 to 25 feet combine to enable the operator to move up quickly on a blistering hot fire and blast it out with the force of the blanketing discharge.

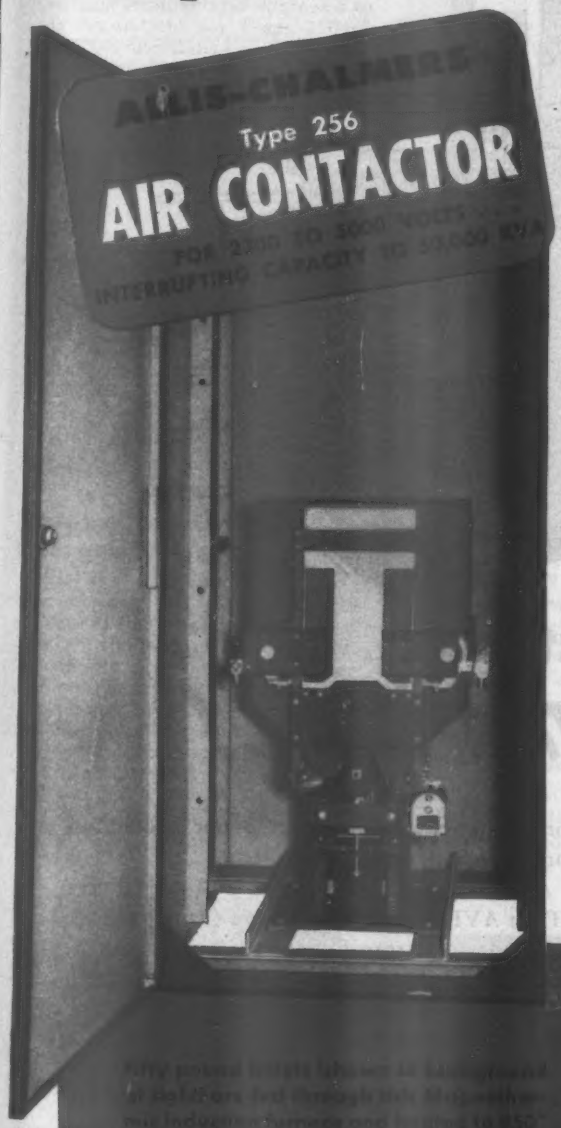
American - LaFrance - Foamite Corp., Elmira, N. Y.

Multiple-Unit Window Annunciator

Panalarm visually signals off-normal operation in process industries and power installations. The back-lighted mulitple-unit window annunciator flashes a warning message when trouble brews.

Hermetically sealed cabinets are

30,000 Operations *EVERY* Month



"THIS TYPE 256 CONTACTOR operates under full load approximately 30,000 times per month. We have yet to find another contactor that will stand up under this service!" says J. A. Logan, president of Magnethermic Corporation, manufacturers of low frequency induction heating equipment.

"This contactor is now standard equipment on all of our 2300 and 4000 volt furnaces. All other high voltage contactors that we originally installed on our furnaces have been replaced by the Allis-Chalmers Type 256 Air Contactor."

Opening and closing the primary of an induction furnace at full load once every minute may be different than your control problem. But think of the years of trouble-free service a contactor capable of this duty will give you on normal motor starting applications!

What makes performance like this possible? Double break contacts and straight line vertical action are combined in Type 256 Air Contactors to eliminate maintenance factors such as flexible contact leads, turning shafts and shaft bearings.

Magnethermic Corporation's experience is typical . . . indicates the service you too can expect from Type 256 Air Contactors. These contactors are clean, easy to inspect, accessible, and compact. Call your Allis-Chalmers representative, or write for bulletin 14B7303. Allis-Chalmers Mfg. Co., Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

YOU CAN BE SURE... IF IT'S
Westinghouse

One Set of Connections
THAT'S ALL!

No need to install separate switches and protective devices with Westinghouse Dry-Type Transformers, Types AJRB and AVRB. They have circuit breakers built in!

It's a better installation, too. The integral breaker gives three-way protection . . . something no combination of transformer and external protectors can do. Because the breaker is located inside the transformer case, it is actuated by (1) overcurrent, (2) temperature, or (3) by both in combination. Greater safety for equipment on the line! Better protection for the installation!

Available in ratings from 100 to 15 kva (Type AVRB) and 10 to 3 kva (Type AJRB). Other dry-type transformers without breakers are available.

Ask your Westinghouse representative for further information, or write for Booklets B-4009 and B-4439. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70577

Westinghouse
DRY-TYPE
TRANSFORMERS

constructed with the number of alarm windows desired. The one-piece unit containing signal lights and relays plugs into a special chassis, simplifying installation and servicing. Annunciator conforms to code regulations for Class 1 Division 2 specifications.

Panalarm Products Co., 7218 N. Clark St., Chicago 26.

Adaptor for Giving Emergency Oxygen

With the new Linde L-26 liter-flow adaptor you can administer oxygen from a cylinder capped with an industrial-type regulator. The adaptor converts pounds per square inch pressure to liters per minute flow. A scale stamped on the side gives the equivalent liter flow for a corresponding psi. regulator gage pressure.

Linde Air Products Co., Union Carbide & Carbon Corp., 30 E. 42 St., New York 17.

Low-Pressure Fog Nozzle

Extremely fine and uniform fog droplets are said to be produced at low operating pressures by a new line of low-capacity nozzles. Using the pin-jet impingement principle, these nozzles have no internal parts—they cannot clog with foreign particles smaller than the orifice, claims the manufacturer.

Ten orifice sizes range from .015- to .080-in. diameter with flow rates from 1 to 100 gph. Pin design is said to reduce interference of the pin with the fog pattern. Nozzles

Rubber-base (Parlon®) Paints GIVE EXTRA PROTECTION against Acids and Alkalies

Where other paints fail because of acid or alkaline plant conditions, it may pay you to specify corrosion-resistant, rubber-base paints. For concrete and most metal surfaces, paints properly formulated with "Parlon" (Hercules Chlorinated Rubber) are unsurpassed for resistance to common destroyers of maintenance paints. Besides alkali and chemical resistance, these paints have outstanding wear resistance, dry fast, and are easy to apply.

More than 500 paint manufacturers now offer one or more rubber-base paints made with chlorinated rubber. These maintenance paints may cost a little more per gallon, but usually cost far less per square foot per year. We'll be glad to supply the names of several firms in your locality who can advise you.

HERCULES POWDER COMPANY
905 Market St., Wilmington, Del.

Send further details on "Parlon" paints and names of suppliers.

Name_____

Company_____

Address_____

CR51-1

Removes 2 TONS of incrusted dirt in less than 8 HOURS!

IN ONE OPERATION a Tennant Machine cuts grime from floor . . . picks it up. Many models, electric or gas. Also 36" and 24" high speed POWER SWEEPERS for dust, litter, debris.

AN EASY ONE MAN JOB WITH THE

TENNANT

INDUSTRIAL FLOOR MACHINE

Pulverizing and shearing thick hard grime from floors at the amazing rate of 8 to 20 lbs. per *minute*, the Tennant Industrial Floor Machine makes a fast, easy job of *any* floor-cleaning assignment, no matter how tough!

Removes hardened tar, grease, dried paint, cement splashes and similar material like magic.

Guaranteed to do the job!

REVO-tool pulverizes and removes thick incrusted grime. Provides over half million impacts per min

The way to finer floors TENNANT Floor Maintenance System

FEATURES

- **REQUIRES ONLY 1 MAN**
- **PICKS UP SOILAGE** as it goes. Eliminates extra sweeping.
- **SMOOTHS AND LEVELS** surface while cleaning. Leaves floor hard, dry, ready for traffic.
- **ELIMINATES CHEMICALS** or need for soap and water.
- **NO INTERFERENCE** with normal plant operations.

Write Today!

Get full details about the results *you* can get with Tennant Floor Machines . . . or Tennant Power Sweepers.

Tennant 24" Power Sweeper for fast sweeping in busy plants.

G. H. TENNANT CO.

2554 N. 2ND ST. • MINNEAPOLIS 11, MINN.

are available from stock in brass with stainless steel pins—you can get them in various other metals to order.

Bete Fog Nozzle, Inc., Greenfield, Mass.

Emergency Exit Light

When regular lighting power fails, this exit light automatically continues to operate on self-contained batteries. A beam also lights the surrounding floor area. Under normal conditions the unit operates as an ordinary exit light.

The 7½-volt dry cell battery will provide 8 hours of emergency light—ample time for the safe evacuation of premises when the lights go out.

Electric Cord Co., 30 Church St., New York 7.

•

SAFETY GLOVES, made of neoprene-impregnated canvas for heavy-duty wear, have a nonslip grip for grabbing wet objects. Fingers are curved for comfort and efficiency. Available in a complete range of gauntlet and knit-wrist styles. Pioneer Rubber Co., Willard, Ohio.

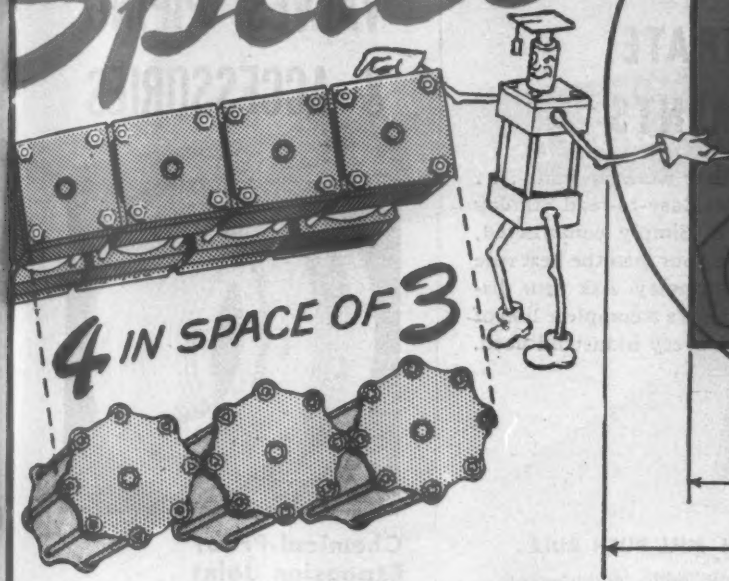
ALL-PLASTIC GOGGLES, for smaller faces, have replaceable plastic lenses that give shatterproof protection and undistorted vision. Frames are designed to fit comfortably women and men with small features. American Optical Co., Southbridge, Mass.

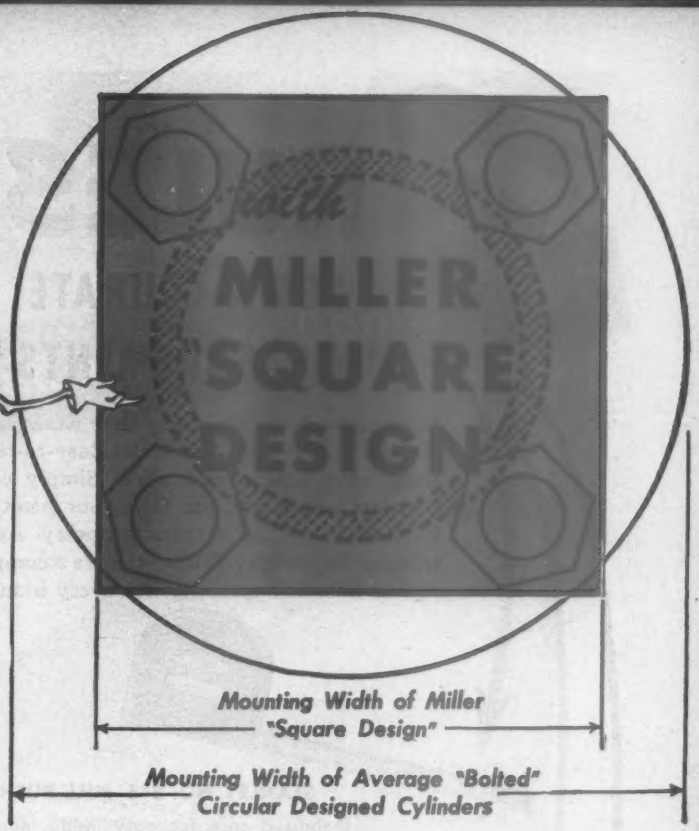
RADIATION MONITOR measures the total amount of gamma radiation in a given area over a period of time. Self-contained unit, using no batteries or tubes, is not susceptible to moisture or dirt. You charge by inverting. General Electric Co., Electronics Park, Syracuse, New York.

FIRE HYDRANT, by utilizing ball bearings, reduces force needed to operate it, eliminates stuffing box and packing gland, and cuts down on maintenance service. Darling Valve & Mfg. Co., Williamsport, Pa.

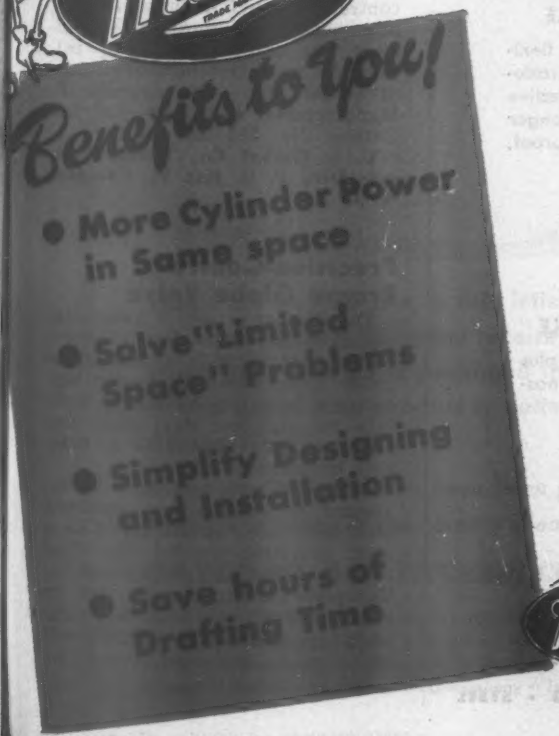
More on next page

Save Space





Air *and* Hydraulic CYLINDERS...


Benefits to You!
• More Cylinder Power in Same space
• Solve "Limited Space" Problems
• Simplify Designing and Installation
• Save hours of Drafting Time

The SQUARE DESIGN of Miller Cylinders saves up to 25% of mounting space, permitting more cylinder power in the same space and easier, more convenient installation in "tight spots." Thus, in many cases, machines and equipment can be designed more compact and less costly by using Miller Cylinders. Hours of drafting time can be saved — as only a few straight lines show any view on drawings.

The illustration at upper left shows graphically how *four* Miller Cylinders can be mounted, bore for bore, in the same space required for *three* average "bolted" circular designed cylinders. Some Miller bore sizes permit even greater space-savings.

Other important *standard* features of all Miller Cylinders include: solid steel heads, caps and mountings, hard chrome plated piston rods, dirt wiper seals, and other "quality" features as shown in illustrated bulletins sent FREE on request. Remember, too, that Miller Hydraulic Cylinders (2000-3000 psi) meet the J. I. C. Hydraulic Standards.

Write for illustrated cylinder bulletins A-105 and H-104

COMPLETE MILLER CYLINDER LINE INCLUDES: AIR CYLINDERS, 1½" to 20" BORES, 200 PSI OPERATION; LOW PRESSURE HYDRAULIC CYLINDERS, 1½" TO 6" BORES FOR 500 PSI OPERATION, 8" TO 14" BORES FOR 250 PSI; HIGH PRESSURE HYDRAULIC CYLINDERS, 1½" TO 12" BORES 2000-3000 PSI OPERATION. ALL MOUNTING STYLES AVAILABLE.

Miller

MILLER MOTOR COMPANY

4033 N. KEDZIE AVENUE, CHICAGO 18, ILLINOIS

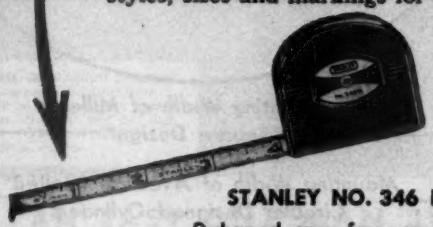
AIR AND HYDRAULIC CYLINDERS · ACCUMULATORS · COUNTERBALANCE CYLINDERS · BOOSTERS · AIR HOISTS

CLEVELAND — PITTSBURGH — PHILADELPHIA — DETROIT — YOUNGSTOWN — BOSTON — HARTFORD — NEW YORK CITY — DAYTON — ST. PAUL — FORT WAYNE — INDIANAPOLIS — MILWAUKEE — NASHVILLE — SEATTLE — LOS ANGELES — SAN FRANCISCO — BALTIMORE — ST. LOUIS and OTHER AREAS.

s and Service from coast to coast

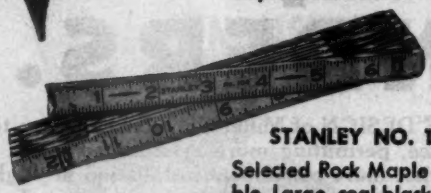
3 RULES FOR ACCURATE MEASUREMENTS

Accuracy—that's the thing that workers want . . . and get in every Stanley Rule. Easy-to-read Stanley Rules save time, speed work. Simply constructed, they last longer, cost less. Give your men the best rule for their job . . . give them a Stanley. Ask your distributor for Stanley Rules—there's a complete line of styles, sizes and markings for every industrial need.



STANLEY NO. 346 PULL-PUSH RULE

D-shaped case for easy inside measurements, two-tone chrome finish. Rust-resistant spring steel blade — nickel-plated or white enamel face. Large, easy-to-read, coal-black Gothic numerals. Replaceable blade. 6, 8 or 10 ft. lengths.



STANLEY NO. 106 ZIG-ZAG RULE

Selected Rock Maple sticks — tough and flexible. Large, coal-black Gothic numerals. Graduated in 16ths on all edges. New protective plastic finish on all sticks — 4 times longer wearing. Solid nickel silver joints — rustproof. "Ball socket" action keeps rule rigid.

STANLEY NO. 227 EXTENSION RULE

All the features of Stanley Zig-Zag Rules plus a 6" solid brass extension for inside measurements. Extra thick sticks.

STANLEY TOOLS
New Britain, Conn.

THE TOOL BOX OF THE WORLD

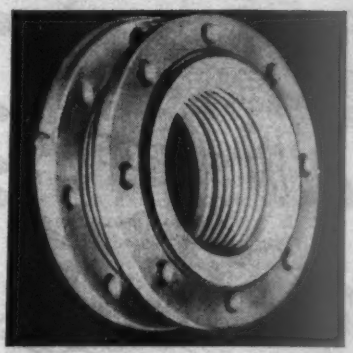
STANLEY

Reg. U.S. Pat. Off.

HARDWARE • TOOLS • ELECTRIC TOOLS • STEEL STRAPPING • STEEL

Begins on page 146

VALVES, PIPING & ACCESSORIES



Chemical-Proof Expansion Joint

Where thermal expansion, vibration, misalignment, or other conditions demand a flexible, chemical-proof piping section, a new Chemiseal expansion joint is on hand to tackle the job. Made of solid Teflon, it cannot be attacked by nor contaminate any known chemicals used commercially.

These joints compensate axial contractions and expansions, misalignment and vibration. Chemiseals are designed for 25 psi. pressure and a temperature range of —150 to +400 degrees F. Manufacturer will send you his Catalog No. 212 on request.

U. S. Gasket Co., Teflon Products Div., P. O. Box 93, Camden. N. J.

Precision-Control Bronze Globe Valve

The Fairbanks people have completed their line of Micro-Control valves with a 150-lb. bronze globe valve. They say that precise control and durability have been built into the stainless steel plug disc and seat, heat-treated to a Brinnell hardness of 500.

Plug disc and seat may be reground or replaced in matched sets. They are manufactured as a unit, precision ground for close control of flow and perfect seating. Two-piece union bonnet and its radial seat are said to insure tight body-bonnet joint, rigid alignment of all parts, and easy access for

That's the pay-off line in this letter — the good relations builder! *"Shipment received in good condition."* When your product is packaged in Gaylord boxes — you know your product is better *protected* — All the Way!

For years Gaylord boxes have been protecting the products of many of the country's leading manufacturers.

Gaylord Boxes

GAYLORD CONTAINER CORPORATION, General Offices: **ST. LOUIS**

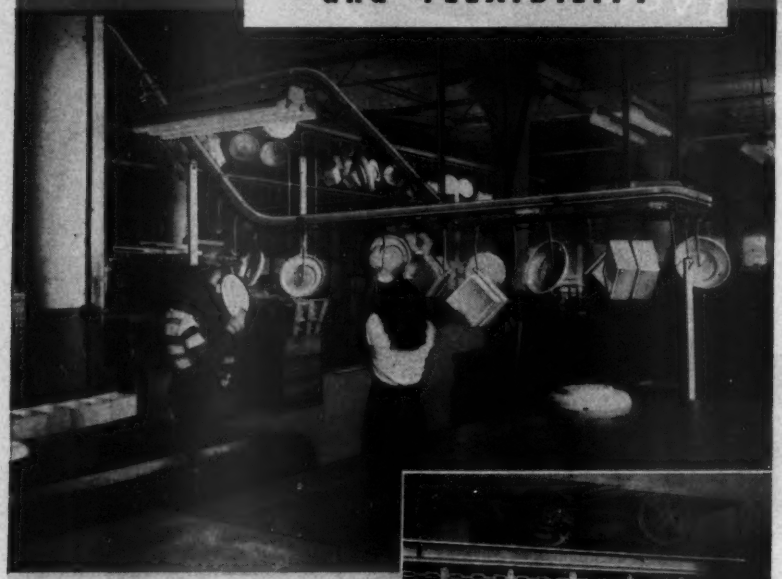
New York • Chicago • San Francisco • Atlanta • New Orleans • Jersey City • Seattle • Indianapolis • Houston • Los Angeles
Oakland • Minneapolis • Detroit • Columbus • Fort Worth • Tampa • Cincinnati • Dallas • Des Moines • Oklahoma City • Greenville
Portland • San Antonio • Kansas City • St. Louis • Memphis • Bogalusa • Milwaukee • Chattanooga • Weslaco • Appleton
Hickory • Sumter • New Haven • Greensboro • Jackson • Miami • Mobile • Omaha • Philadelphia • Little Rock • Charlotte

MHS

Junior Monoveyor

assures Overhead Handling

With MAXIMUM ECONOMY and FLEXIBILITY



The MHS Junior Monoveyor provides a means of handling light and medium loads overhead more effectively and more economically than with the standard conventional overhead conveyor. It may be laid out to meet any specific manufacturing, transportation or storage requirements where loads and distances are appropriate.

It is constructed of standardized precision made components, mass produced for maximum economy. The selection of these components is sufficiently wide to permit full flexibility.

Line friction has been reduced. Inclines may be steeper and minimum allowable radii are substantially less than they are with the standard, conventional overhead conveyor.

For details and specifications, write for Bulletin JM-1.

Mechanical Handling Systems, Inc.

4608 NANCY AVE. • DETROIT 12, MICH.

Offices in Principal Cities

MHS

regrinding or replacement. Complete details on valve specifications from maker on request.

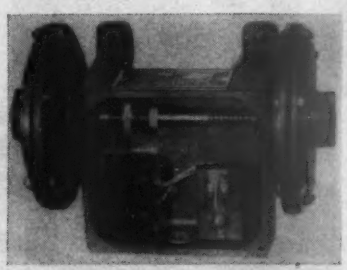
The Fairbanks Co., 393 Lafayette St., New York 3.

Y-Pattern Swing Check Valve

A new line of Y-pattern swing check valves can be used on lines where flow is horizontal or upward. The brass valves, of the regrinding type, are in the 200 and 300 psi. pressure classes. Screwed end patterns are available in sizes ¼ to 3 inches; flanged end patterns in 1- to 3-in. sizes.

A large cap opening on the same center line as the seat opening provides easy access for regrinding or replacement of parts.

Crane Co., 836 S. Michigan Ave., Chicago 5, Ill.



Differential Pressure or Vacuum Control

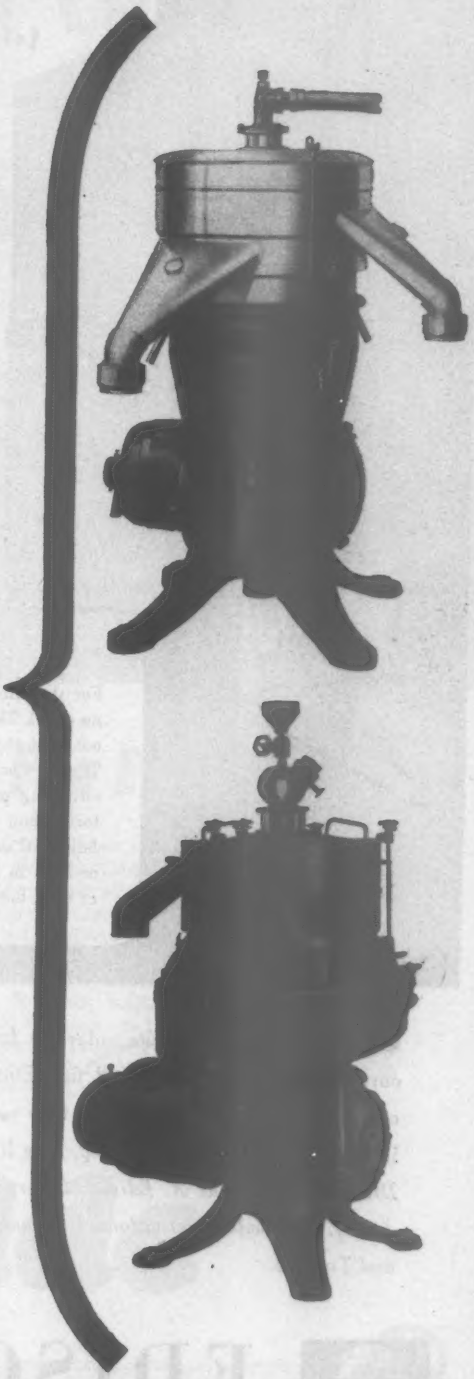
The 111-D differential pressure control is airtight on both pressure and vacuum sides of the diaphragm. It is designed to regulate the pressure between two vessels, when no leak path can be tolerated. The 111-D operates on very low differential pressures in the inches-of-water range—either pressure or vacuum. Single pole double throw contacts are rated 10 amp. at 125 volts, 5 amp. at 250 volts, 60 cycles. Cut-in and cut-out points are determined by a fixed differential, and provide a direct start-stop circuit without relays.

The Henry G. Dietz Co., Coral Designs Div., 12-16 Astoria Blvd., Long Island City 2, N. Y.

Reducing Valve

Bleed off in the Hydreco VA Series pressure reducing valves is accomplished through the main plunger, rather than through an auxiliary or pilot plunger. This feature is said to reduce hunting and assure steadier output pressure. The plunger-operated valves are designed for reducing line pressure in oil-hydraluic control systems. Available in capacities up

CENTRIFUGAL FORCE saves TIME!



De Laval Oil Purifiers and Industrial Separators effect in seconds separations that formerly would have required minutes or even hours. By centrifugal force, they remove solid and liquid impurities continuously and thoroughly. And — an important advantage — they make such separations at a constant rate of efficiency.

Both metal-working plants and process industries plants can use centrifugal force to advantage. In metal-working plants, the problem is usually one of removing metallic or abrasive particles from cutting oil or coolant, or removing water from hydraulic oils, slushing oils, etc. In all such cases, De Lavals save the oil, protect the work, and speed up the salvage or maintenance operation.

In the process industries separation, clarification or concentration can all be markedly speeded up, with resultant saving of production time. Centrifugal force removes bottlenecks . . . makes these processes continuous.

● Write . . . and mention what type of separation you are most interested in.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 · 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

De Laval

PURIFIERS and CLARIFIERS FOR FACTORY OILS

2 STEPS

to stepped-up handling

1. Use durable and dependable trucks. *Battery* trucks are a profitable investment: their electric drives start smoothly, have few wearing parts, use no explosive fuel, run without warm-ups or tune-ups. *They run with a minimum of down-time!*

★

2. Equip them with trouble-free batteries . . . the kind that take temperature extremes, jars, jolts and accidents as part of the day's routine. All of which is another way of saying: use EDISON Batteries . . . The Standard of Comparison for the Industry.

★

For this kind of duty, EDISON cells have no equal. They're built of steel inside and out, and their electrolyte preserves steel. They are not injured by accidental short-circuiting or reverse charging. Case histories show that many of them which have fallen off docks or down elevator shafts, or been in fires and floods, are still hard at work today!

For full information, write today for free booklet SB 2039 and a current price quotation. You'll find EDISONS cost little more than other makes of batteries . . . and they pay this back over and over in terms of low upkeep and long, long life. *Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, New Jersey. In Canada, International Equipment Company, Ltd., Montreal and Toronto.*

EDISON

Nickel · Iron · Alkaline

STORAGE BATTERIES

Typical Truck Battery

to 15 gpm. with pressure settings up to 1000 psi.

Hydraulic Equipment Co., 1100 E 22 St., Cleveland 17.

Off-Center Valve for Saturated Steam

This off-center valve is said to simplify the control of 15 psi. saturated steam with low pressure drop. Double crank arm with adjustable weights facilitates accurate settings. The 8-in. diameter valve has 150-lb. raised face flanges. A 2-in. flanged outlet on the side provides for overload relief. Ask manufacturer for data sheet with engineering specifications.

R-S Products Corp., 4600 Germantown Ave., Philadelphia 44.

Air Separator

The Swartwout Airfuge removes moisture, oil, scale, and solids from compressed air by means of centrifugal force. Impurities are whirled outward to the walls of the separator, where they drain down to a trap section. Maker says it does a 99% cleaning job without pressure drop. Available in 7 inlet and outlet tappings, from ½ to 2½ inches.

The Swartwout Co., 18511 Euclid Ave., Cleveland 12, Ohio.

•

AIR FILTER removes oil, dirt and moisture from compressed air lines. The Fulflo steel filter and replacement cartridges come in ¾-in. pipe size with mounting bracket—operate at pressures up to 125 psi., capacities up to 60 cfm. Hanson-Van Winkle-Munning Co., Matawan, N. J.

REDUCING VALVES, rated up to 6000 psi., have been given Stellite-faced main valves and seat rings for longer wear. Ask maker for full description of his 197-135 Type E line. Atlas Valve Co., 282 South St., Newark 5, N. J.

More on next page

—of a Kidde Dry Chemical Fire Extinguisher

Pound for pound, *Kidde* Dry Chemical Fire Extinguishers give you more *protection* for fires in flammable liquids, live electrical equipment and for textiles.

Proof? Factory Mutual Laboratories requires a 20 lb. dry chemical fire extinguisher, in the hands of an experienced operator, to effectively cover 25 square feet of burning area. *The Kidde 20 pounder covered 36 square feet . . . a 44% margin of safety!* And—the tests require a 30 pounder to cover 35 square feet . . . *but Kidde's Dry Chemical extinguisher reached out 48 square feet!*

Why is Kidde better? A special Diffuser Horn applies heat-absorbing, fire-smothering dry chemical in an effective cloudlike pattern that blankets the danger area, helps eliminate splashing of burning liquids, and protects the operator from heat.

Ruggedly built, simply constructed, quick to recharge and equipped with easy-to-operate Trigger Finger Control, *Kidde* Dry Chemical Extinguishers mean sure death to fire—and extra safety for you.

Kidde Dry Chemical Extinguishers can be used in normal standing position, just pick unit up, point the horn, pull the trigger.

Streamlined diffuser horn gives better discharge pattern, means greater coverage, insulating blanket for the operator.

Kidde

Walter Kidde & Company, Inc., 132 Main Street, Belleville 9, N. J.
In Canada: Walter Kidde & Company, Ltd., Montreal, P. Q.

Start With Any One of These

FOUR WAYS To Cut Your Handling Costs

1 WITH ROLLER OR BELT CONVEYORS

— Wherever packages, parts, or units have to be handled — do it faster, better, cheaper, with Standard roller or belt conveyors, power or gravity. Standard also builds slat, chain, wheel, or pushbar conveyors to fit your needs.

2 with a HANDIBELT

— a small, light, compact, easily portable and maneuverable conveyor unit that stacks, loads, unloads cases, cartons, packages up to 135 lbs. in weight. Can be used inclined, declined or horizontal. Electric motor operated.

3 with SPIRAL CHUTES

— effective time, work and money savers lowering pieces, parts, packages floor to floor. Scientifically designed and properly pitched—available in many types and sizes. Cost nothing to operate.

4 with PNEUMATIC TUBE SYSTEMS

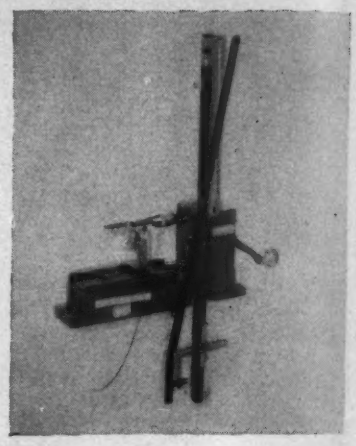
— provide swift, sure, safe transportation of messages, documents, blueprints, samples, small parts, money; cylindrical or oval tubes 1½ inch upward with dispatching and receiving terminals for complete systems to meet your needs. Write for special bulletin SPT.

Write for Standard's general Catalog FM-11. Tell us what you want to handle or name equipment on which you want more information.

STANDARD CONVEYOR COMPANY
North St. Paul 9, Minn.
Sales and Service in Principal Cities

Begins on page 142

MISCELLANEOUS



Spring Coiler

You can roll your own with a hand-operated spring coiling machine. This machine coils compression springs with ends closed or squared up to 28 turns; extension springs, tight or loose, up to 100 turns; and torsion springs, either right hand or left hand, with extended arms up to 3 inches long on either side.

Springs can be made up to 4 inches long with outside diameters up to 7/8 in. Wire diameters range from .005 to .065 in. Equipment includes 29 arbors, 3 coiling points, and a wire cutter.

The Carlson Co., 277 Broadway, New York 7.

Anode for Anti-Corrosion Tank Protection

Jumbo-sized 3-in. diameter Elno anodes extend the benefits of anodic protection from rust and corrosion to large volume storage tanks with capacities up to 2000 gallons. These anodes inhibit the corrosion of tank interiors by electrolytic action.

The 3-in. anodes come in basic units 21 in. long. They are rigidly coupled together to form a multi-section anode the length of the tank. Anode section can be mounted on hangers suspended inside the tank, or strung between plugs tapped into either end of the tank.

The Cleveland Heater Co., Elno Div., 2310 Superior Ave., Cleveland.

More on next page

only GUMMED TAPE gives such protection against

PILFERAGE AND DAMAGE CLAIMS

Only by using gummed tape can you seal cartons *with your company name imprinted on the seal.* Petty thieves cannot pilfer without being detected, for they are unable to replace your exclusive tape. The tape warns your consignee not to accept the carton if its seal is broken. You don't risk blame for careless count when your shipment has actually been pilfered.

Gummed tape gives your merchandise better protection in transit, too. It seals out smoke, dust, moisture, and vermin. It adds reinforcement to your cartons where most needed: at corners and seams. Because tape is a flexible closure, it helps your cartons better to withstand shock.

You build good will when you deliver goods protected against pilferage and damage claims with *gummed tape!*

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For better performance

ORANGE CORE IS NOW *Supple-ized**

Supple-izing is an exclusive Hudson process to make Orange Core tape more flexible. The adhesive and kraft are treated to take out the stiffness and prevent curling. *Supple-izing* makes Orange Core pliant and supple . . . easier and faster to handle.

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GUMMED SEALING TAPE

Available plain or printed, in choice of widths, weights, lengths and colors.

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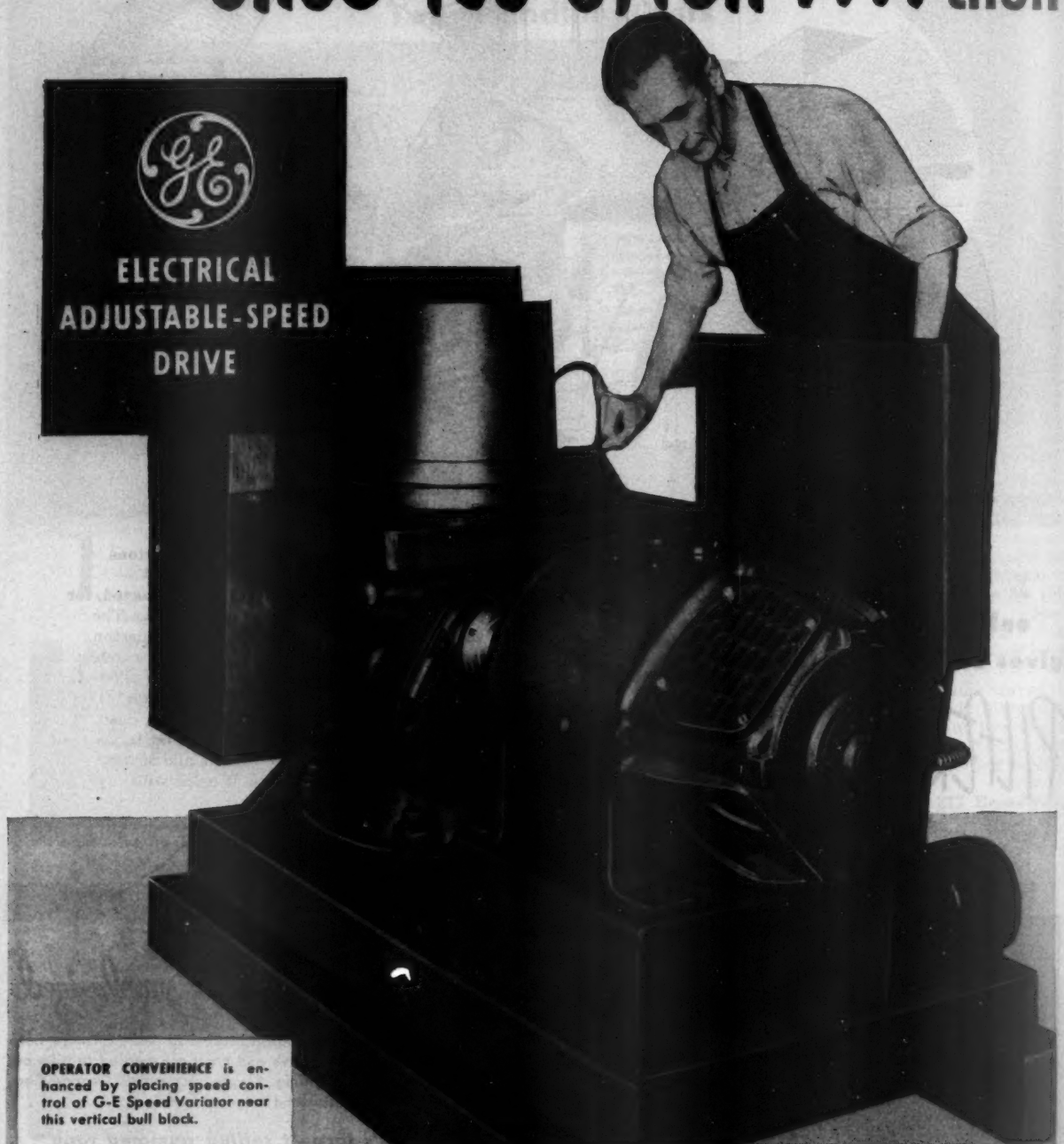
SOMETHING SNAPPED
once too often .... then


ELECTRICAL
ADJUSTABLE-SPEED
DRIVE
OPERATOR CONVENIENCE is enhanced by placing speed control of G-E Speed Variator near this vertical bull block.

GENERAL ELECTRIC

Bishop Co. tried adjustable-speed drive and set new production records!

G-E "PACKAGED" SPEED VARIATOR has a 4 to 1 speed range for drawing platinum wire on a vertical bull block.

G-E TYPE ACA MOTOR with a 3 to 1 speed range drives horizontal bull block, brings machine up to speed without "snapping" stainless-steel tubing.

WHEN you're drawing wire and tubing thinner than a human hair, frequent breakage can be a major headache. At least it was for the J. Bishop Company until electrical adjustable-speed drive came to the rescue.

If a drawing or spooling machine drive came up to speed too fast, "SNAP"—another die had to be changed. Or, if the equipment was operated slowly, production was severely limited.

Finally, "something snapped" once too often—and General Electric adjustable-speed drives were selected for the different types of machines. A G-E Speed Variator with a 4 to 1 speed range was installed on a vertical bull block. Result? One simple drawing operation instead of the complicated swaging and multiple-die drawing formerly required. Next, a G-E Type ACA motor with a 3 to 1 speed range was put on a horizontal bull block, drawing stainless steel tubing. Production jumped from 28 fpm to 120 fpm. Finally a platinum spooling machine was equipped with a G-E Thy-mo-trol* drive. Jerking and breaking are rare now and the spooler can handle any diameter from .001 to .020 inch, thanks to the 20 to 1 speed range of the Thy-mo-trol drive.

Chances are you, too, stand to gain from an efficient application of *electrical adjustable-speed drive* somewhere in your plant. To help you profit from these opportunities, we suggest you do the following:

1. Send for our 24-page bulletin (GEA-5334), "Getting The Most Out Of Your Machines."
2. Call in a G-E engineer to help you with application details.
3. Keep in mind that General Electric can offer you *all* types of electric adjustable-speed drives in speed ranges of 3 to 1 to 50 to 1.

Apparatus Department, General Electric Company, Schenectady 5, New York.

*General Electric Co. registered trademark for electronic drive.

G-E THY-MO-TROL DRIVE operates platinum-wire spooling machine over 20 to 1 speed range, replaced drive which lost power at slow speeds.

SIGNIFICANT LABOR DEVELOPMENTS

. . . told in brief for busy factory executives

By **PAUL A. KING**, *Assistant to Vice President for Personnel, Bigelow-Sanford Carpet Company, Inc. Member, New York Bar.*

GOVERNMENT CONTRACTORS CAN ASK DISCRIMINATORY EMPLOYMENT QUESTIONS. *The federal agency giving you a contract may compel you to ask applicants security questions which violate anti-discrimination laws. N.Y. says it's all right, but—* **Page 214**

NEGOTIATED PENSION PLANS PASS TAX MUSTER. *The Federal Tax Commissioner lets employers with negotiated pension plans take advantage of the special tax deduction in Section 165 of the Internal Revenue Code* **Page 214**

AGGRESSOR GETS THE TOUGHEST PENALTY FOR FIGHTING. *If this arbitration award is accepted generally, you'll have to be careful in deciding who is the aggressor* **Page 216**

TWO PUNISHMENTS MAY FIT ONE CRIME UNDER WAGE LAW. *Wage-Hour Division uses federal False Information Act to impose severer penalty for wage-hour records* **Page 216**

UNION ARGUES RETIRED FOREMAN SHOULD GET SHOP JOB. *New twist in labor's fight against compulsory retirement* **Page 218**

STIFF PENALTY FOR NOT PAYING TERMINATED EMPLOYEES. *State wage-payment laws can be troublesome. Here's the sad story of one Oregon employer* **Page 218**

EMPLOYER CAN WARN STRIKERS THEY'RE THROUGH. *These were economic strikes and the warnings were factual—no threats or intimidations* **Page 220**

NO NLRB VOTE FOR MEMBERS OF ARMED FORCES. *NLRB, as a rule, will not permit former employees in the armed forces to vote. It would delay election* **Page 220**

BRIEF—BUT IMPORTANT. *Labor lawyer's services are a contract cost. . . . How thorough can the Wage-Hour Division be? . . . Veteran reemployment rights settled by agreement. . . . The little gal wasn't so innocent. . . . Unemployment benefits are OK for Ford workers idled by strike* **Page 222**

Government Contractors Can Ask Discriminatory Questions

If you are looking for government contracts and your plant is in a state with a no-discrimination-in-hiring law, you may run into this conflict: For security purposes, the federal agency giving you the contract may compel you to ask job applicants questions that may violate the state law.

The New York Commission Against Discrimination has a way out. It says it will let the employer ask the questions. But he must present a certificate from the federal agency saying that the questions are required to get the contract.

Check your state commission for a similar ruling.

Negotiated Pension Plans Pass Tax Muster

The Federal Tax Commissioner considers a negotiated pension plan as permanent — even though the union contract setting it up may be only for five years. He recently ruled this way in PS 64, a ruling of the Pension Trust Division.

In a nutshell, this ruling means that a company can "fund" a negotiated pension plan. It does not have to keep it on a pay-as-you-go basis to get a tax reduction.

Here's the story. As a general rule of taxation, an employer is allowed to deduct only for expenditures actually made—or paid—in the tax year. When a pension trust is set up (or a payment made to an insurance company fund) the employer puts money aside—into the fund—each year. But the money won't actually be paid out until his employees retire, perhaps 10 or 15 years later. Since the expenditures have not been completed, as a rule, no tax deduction will be allowed in the year the money is put aside.

But, to encourage pension funds, the tax law allows an employer to deduct for amounts not paid out immediately. He can take his deduction right away. This is an advantage to the employer—particularly in the present high tax years.

But there is a catch. The fund—or trust—must meet the requirements of Section 165 of the tax law. One key requirement is that the pension plan must be *permanent*. Another, benefits must be *definite*.

In PS 64, the Commissioner ruled that a pension trust set up under a five-year union contract was permanent enough for tax purposes. He also ruled that pensions of $100 for employees with 25 years of service at age 65, less for employees with fewer years of service, were definite enough.

NEW SCRUBBER-VAC

Cuts Cleaning Time 2/3

FOR SMALL-AREA FACTORIES

- Specially designed for buildings with 2,000 to 15,000 sq. ft. of floor space
- Applies the cleanser, scrubs, rinses, and picks up in ONE operation
- Also handles the dry work — steel-wooling, polishing, et cetera
- Can be leased or purchased (leasing budgets cleaning expense)

Now the labor-saving advantages of *combination-machine-scrubbing* are available to small as well as larger factories. The *new 418P Finnell Scrubber-Vac,* for small-area buildings with 2,000 to 15,000 sq. ft. of floor space, cleans floors in *approximately one-third the time* required with a conventional 15 or 18-inch scrubber-polisher using separate equipment for picking up. A *Finnell Scrubber-Vac* speeds cleaning by handling four operations in one! It applies the cleanser, scrubs, rinses if required, and picks up (damp-dries the floor) — all in a single operation.

Of narrow design, the *new 418P Scrubber-Vac* also meets the need in larger factories for a combination machine that can be used in congested areas and narrow aisles. And all the refinements of *Finnell's* larger combination machines are embodied in this smaller unit (18-inch brush ring). Has new type of water valve that *assures* uniform flow of water . . . powerful vacuum for efficient pickup (performs *quietly*) . . . a *Finnell-developed* trouble-free clutch . . . self-winding cable reel . . . improved waterproof wiring and minimum electrical connections, simplifying the cleaning of the machine . . . G. E. Motors and Timken Bearings. The machine is self-propelled—operator merely *guides* it. Supplied with or without powder dispenser. Incidentally, it's good to know that when you choose *Finnell Equipment,* a *Finnell* man is readily available to help train your maintenance operators in its proper use.

SEE IT IN ACTION ON YOUR OWN FLOORS!

Find out what *you* would save with a *Finnell Scrubber-Vac. Finnell* makes several models and sizes. For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2501 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

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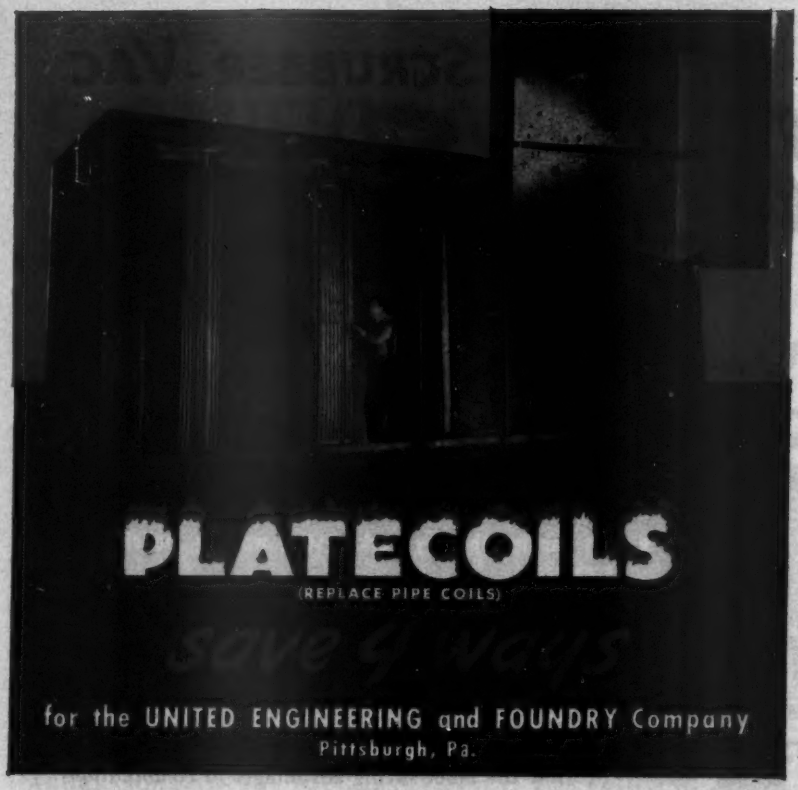

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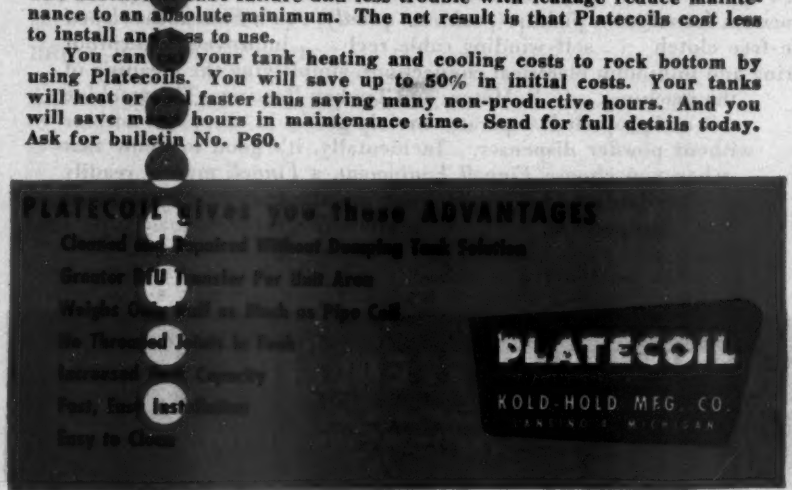
- TAKE LESS TANK SPACE
- REQUIRE LESS MAINTENANCE
- COST LESS TO USE

When United Engineering and Foundry Company first decided to use Platecoils in their Lubricating tanks, ease of installation was the determining factor. Weighing only half as much as equivalent pipe coil, Platecoils are much easier to handle and take less time to install. However, other benefits have resulted that are equally important. Platecoils take only about half as much space in the tank to give it greater capacity. The absence of tube failure and less trouble with leakage reduce maintenance to an absolute minimum. The net result is that Platecoils cost less to install and less to use.

You can cut your tank heating and cooling costs to rock bottom by using Platecoils. You will save up to 50% in initial costs. Your tanks will heat or cool faster thus saving many non-productive hours. And you will save many hours in maintenance time. Send for full details today. Ask for bulletin No. P60.



SIGNIFICANT LABOR DEVELOPMENTS

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This ruling doesn't necessarily mean that an employer may discontinue his plan after the contract expires, even by agreement with the union. On the contrary, if he does discontinue his plan then he is likely to forfeit all, or part, of the tax deductions he took. The Tax Commissioner hasn't ruled on this for sure, so it's still somewhat up in the air.

Aggressor Gets the Toughest Penalty for Fighting

Next time you're inclined to fire employees who violate the company rule against fighting on the job, you ought to consider a lesser penalty for the nonaggressor. You ought to, that is, if the case is arbitrated like the one involving the Knoxville, Tenn., plant of the Robertshaw Fulton Controls Company and a federal labor union (AFL).

The company, not quite knowing who was the aggressor in a fight, discharged both scrappers. But the board of arbitrators insisted on finding out who started the fight. They upheld his discharge but ordered only a layoff of "the other fellow." He was not quite free of blame, although he wasn't the aggressor, the arbitrators reasoned.

Two Punishments may Fit Crime Under Wage Law

Under the federal Wage-Hour Act, the penalty for falsifying wage records is severe. But the penalty for falsifying records under the False Information Act is even more severe. That's why the Labor Department's Wage-Hour Division often tries to bring a case under the False Information Act.

This Act makes it a crime to falsify information to a government official about a matter within his jurisdiction. The penalty is a fine up to $10,000, or a jail term up to 10 years. The fine under the Wage-Hour law can also be $10,000. But the jail term is limited to six months and can be imposed only for a second conviction.

Although the FIA has often been used by the Wage-Hour Division, only one case to date has reached the appeals courts. The court ruled that the Division must first prove the employer is subject to the Wage-Hour Act.

A ray of hope for employers: The court said unofficially that if the

When You Take a Shooting Holiday

GAS will help equip your Safari

Suddenly there's action and your cameras, carefully focused and ready, begin to record the colorful story of your shooting holiday. But long before that thrilling moment Gas performed many of the tasks which make your trip possible.

Your shooting equipment of course, is of first importance and Gas plays a major role in the manufacture of cameras and photographic materials. Your finest lenses are poured from Gas-heated crucibles, and annealed to relieve all stresses during grinding. Gears for your camera are sintered in Gas furnaces for that precision which assures silent operation. Exact temperatures for film processing solutions are maintained with Gas heating units. In dozens of other metallurgical and chemical processes, Gas has helped you film your holiday.

Then you have to travel—long distances over land and water, then by air to the safari assembly point. In all modern forms of transportation, Gas has always been a preferred fuel for heat-treating, metal-working, fabricating. And, as newer types of equipment are developed, Gas fulfills an expanding role in brazing, laminating, stress-relieving—the many operations where heat is required for processing.

Your food and shelter, weighty problems however you looked at them, required a lot of careful study. But Gas had already performed many of the tasks to make your job easier. In processing such as dehydrating, pre-cooking, concentrating, sterilizing, baking, Gas is universally used to prepare the foods you need. And for shelter, too, Gas is the preferred textile-processing fuel, is important in the manufacture of rubberized fabrics, is essential to most production-line heating operations.

But a safari is specialized and you may never need those uncounted items of operational equipment in which Gas supplies the heat for processing, such as chemical exterminators, protective arms and ammunition, radio and sound apparatus. There is a place for Gas, though,

In your own production lines wherever you have a process requiring heat. The applications of Gas in industry are so diversified that you'll find it worthwhile to investigate this essential fuel for your own production heating operations.

AMERICAN GAS ASSOCIATION

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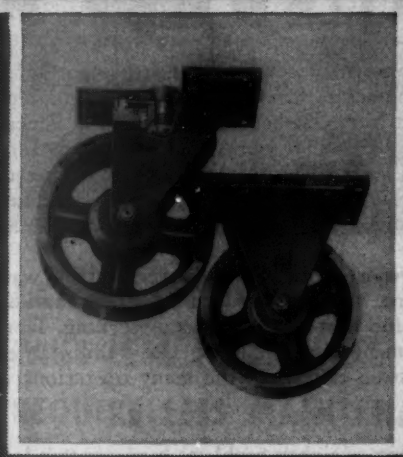
DARNELL CASTERS



There is a type of Darnell Caster or Wheel for every kind of use and floor. Made for light, medium and heavy-duty service, you are sure to find in the Darnell line the exact caster or wheel to meet your individual requirements . . . Ask your distributor for your copy of the new 192 page Darnell Manual

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SIGNIFICANT LABOR DEVELOPMENTS

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issue ever came before it, it might have to rule that the Wage-Hour Act penalty would supersede the more severe FIA. (*Moore, US Ct. Ap. 5th Cir.*)

Union Argues Retired Foreman Should Get Shop Job

Here is what one union cooked up to try to beat an employer's compulsory retirement plan.

A man—call him Smith—was a Ford foreman for several years. Under the company's pension plan for salaried employees, he went on compulsory retirement at age 65. But before he became a foreman, Smith was a member of the production workers' union. And its contract provided that employees promoted as Smith was would accumulate seniority while in the new job—even though it might be out of the union's jurisdiction.

The union said the clause gave Smith the right to use his seniority to get a transfer back to a job in the shop.

Thus, in the union's view, men like Smith would not have to retire at 65. They could merely ask to be moved over into a shop job.

A fine idea for the union. At least, it was until Arbitrator Harry Schulman spoiled it. Won't do, said Schulman, pointing to another part of the contract that said the accumulated seniority counted only when the employer himself transferred or demoted the employee to the shop. (*Ford Award*)

Stiff Penalty for Not Paying Terminated Employees

Watch those troublesome state wage-payment laws. They often prescribe how and when you are to pay your employees.

For example, Oregon has a law that got one employer into trouble. The law required employers to pay employees all unpaid wages at time of termination. If an employer doesn't do this—wilfully—the penalty is that " . . . the wages or compensation of such employee shall continue from the due date . . . at the same rate until paid, or until an action therefor shall be commenced; provided in no case shall such wages continue for more than 30 days." The Oregon employer got into trouble because he didn't pay terminated piece workers promptly. (*McGinnis*)

More on next page

the DIRTIER the better for LAN-O-KLEEN!

DIRT that's really hard to remove . . . that's deeply imbedded in workers' hands . . . that irritates cuts and abrasions—directly affects production figures! Think of the materials your present cleaner won't remove: graphite and metallic dust . . . heavy grime and lubricants . . . even common soil and office dust—no matter how hard you scrub!

LAN-O-KLEEN, the industrial soap powder, is designed for "heavy-duty" dirt removal. A fine corn meal base sponges out the pores . . . while thick suds sweep away surface dirt. As water is added, soothing Lanolin spreads over the skin, leaving hands fresh-feeling and clean as a whistle. Its soothing emollient action won't aggravate cuts and bruises. Further, Lan-O-Kleen and the sturdy Lan-O-Kleen dispenser are a dollar-saving combination—as a West representative can easily demonstrate.

LAN-O-KLEEN the industrial hand cleaner containing LANOLIN

WEST DISINFECTING Company

Show me the hand cleaner that will remove stubborn dirt!

West Disinfecting Company, 42-16 West Street, Long Island City 1, N. Y.
(64 Branches in the U. S. and Canada)

Gentlemen: I'd like to have a local WEST representative come out and give me a demonstration of Lan-O-Kleen.

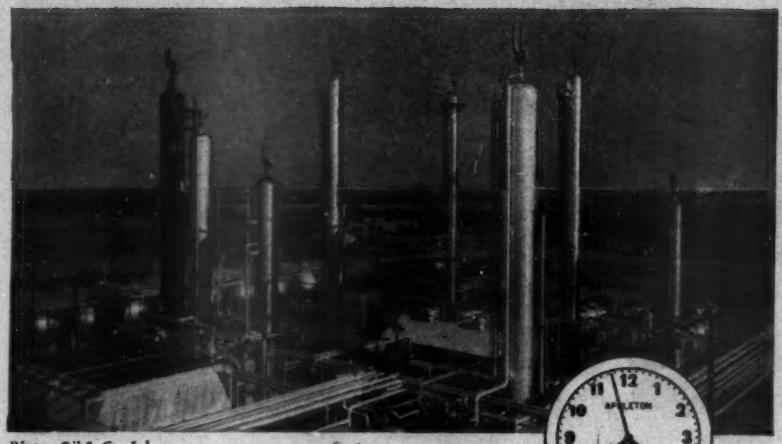
Mr. _____ Position _____

Company _____

Address _____

City _____ Zone _____ State _____

3



Photo—Oil & Gas Jnl.

'round-the-clock

PROTECTION

New Vented Type EVX Explosion-Proof Lighting Fixture. 10% more light, 30% lighter in weight—cooler operating! Pat. No. 2,530,135

Here are conduit fittings and lighting fixtures designed to provide day-and-night protection against the arcs that touch off disastrous fires and explosions in chemical plants, oil refineries, hospital surgeries—wherever explosive or flammable vapors, dusts or gases are present.

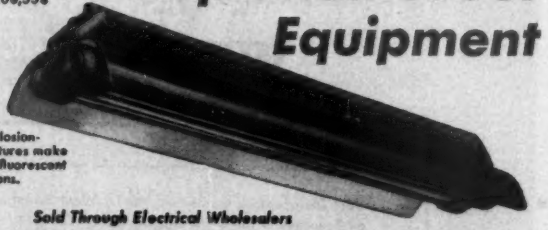
Engineered to completely confine the dangerous sparks that lurk in wiring systems, Appleton Explosion-Proof equipment is easy to install and service. And among the hundreds of fittings and fixtures in the complete Appleton Line is an explosion-proof fitting exactly suited to your needs.

Type FSQX Explosion-Proof and Dust-Tight Plug and Receptacle with interlocking safety switch.

No matter what your lighting or wiring problems, Appleton engineers have the background and knowledge to help you to a practical and economical solution. For the finest electrical fittings and fixtures—explosion-proof or otherwise—specify Appleton, supplier to American builders for nearly half a century.

The Appleton Seal-Line Switch Unilet is a combination switch housing and sealing unit. Completely explosion-proof without additional sealing fittings. Pat. No. 2,208,558

APPLETON Explosion-Proof Equipment



Safety and service features of the Appleton Type EFU Explosion-Proof Fluorescent Lighting Fixtures make them foremost in design of fluorescent lighting for hazardous locations. Pat. No. 2,392,202

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SIGNIFICANT LABOR DEVELOPMENTS

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Employer Can Warn Strikers They're Through

Suppose your workers are out on strike. You send them a letter that says the company intends to operate its plant with new employees unless they return to work by a certain date.

Then when the date specified has gone by, you write them that they are no longer covered by the company's group insurance policy and they had better convert to a standard policy.

Finally you send them a letter asking them to call for personal belongings left at the plant because they have been terminated.

If you wrote letters like these, would you be guilty of an unfair labor practice?

No, said the U.S. Court of Appeals at St. Louis to one employer who engaged in correspondence similar to this. Not if your workers were out on an economic strike (to get better wages and working conditions, in contrast to strikes against alleged unfair labor practices).

The company had the legal right to discharge economic strikers. Its letter did no more than state that the employer had that right. The court disagreed with the reasoning of the NLRB, which had ruled that the warning in the first letter prolonged the strike and turned it into an unfair labor practice strike.

But this is important: The court found that the letters were mild, factual, and free from intimidation or threats. This is a good rule to follow whenever you write a letter to your employees about a labor dispute. *(Kansas Milling, US Ct. Ap. 10th Cir.)*

No NLRB Vote for Members of the Armed Forces

Members of the armed forces have voted for political candidates by mail. Why not let them vote by mail in NLRB elections?

As a rule it cannot be done, says the Board. It would delay the election. *(Link-Belt, NLRB)*

However, the Board says yes to the idea if the unit is small, the ballots few, and if they can be mailed in fast. *(South West Penn. Pipe Lines, NLRB)*

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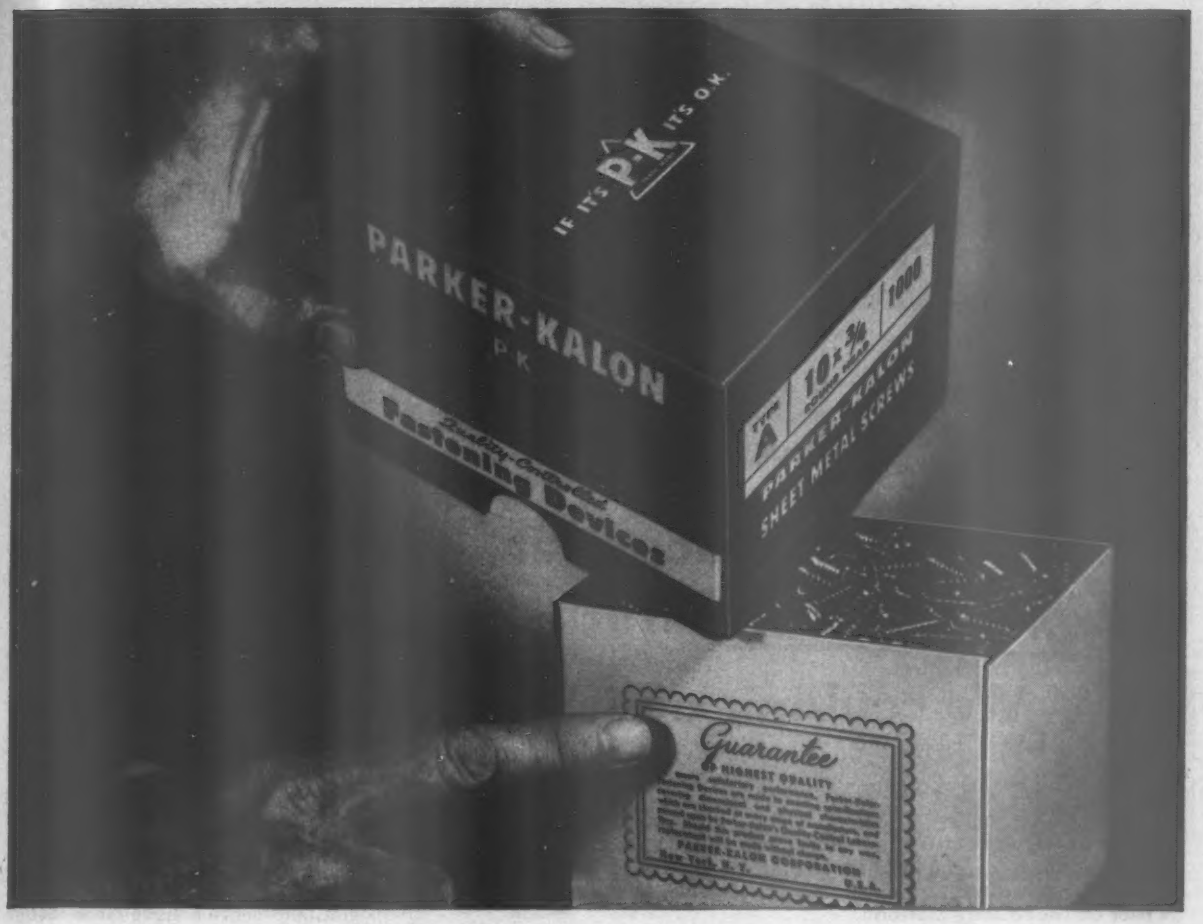

HOW TO UNCOVER EXTRA SAVINGS...

Most manufacturers today are aware of the advantages of using hardened Self-tapping Screws. They save time and simplify assembly by eliminating tapping for machine screws, by avoiding inserts in plastics, by using one operation fastening in place of bolting, riveting, soldering.

But they still may be missing some substantial *extra* savings, because all Self-tapping Screws are *not* alike. Planned savings don't always pay off.

Screws are a bit like people. If they lose their heads when under pressure . . . or turn out to be "softies" . . . or just don't "square up" on jobs, they can slow up a job for sure. You can avoid this by specifying "Parker-Kalon".

When Parker-Kalon developed the *first* Self-tapping Screws, over 35 years ago, they learned how to keep hardness and toughness properly balanced—how to make threads sharp and clean from head to point—in every screw. That's why every screw in every box can be *guaranteed* first quality.

Start making the extra savings you've been missing. Find out why the manufacturers of so many of the nation's best known products say, "If it's P-K* . . . it's O.K.!" A P-K Assembly Engineer will call at your request. Parker-Kalon Corporation, 200 Varick St., New York 14, N. Y. Sold everywhere through accredited Distributors.

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P-K TRADE MARK

The Original

PARKER-KALON* SELF-TAPPING SCREWS

A Z HEX HEAD Z A, U, F, F-Z AVAILABLE WITH PHILLIPS HEAD F U F-Z

OTHER P-K PRODUCTS: Cold-Forged Socket Screws, Wing Nuts, Thumb Screws • Hardened Screwnails and Masonry Nails • Shur-Grip File and Solder Iron Handles • Metal Punches • Damper Regulators and Accessories

Get along without our *battery electric* trucks?

We couldn't do it!*

"NO SIR! Take away those trucks from our operations and we'd be sunk! And I'll tell you why.

"FIRST OF ALL, WE'VE BEEN USING ELECTRIC TRUCKS SINCE 1932 here at our plant. We've come to depend on them so much that they're part of our manufacturing procedure . . . on the production line, in the warehouse and over on the loading platform.

"THEY'RE REAL MONEY-SAVERS. Not so long ago we mechanized one of our departments, and battery-electric trucks were installed. On one operation we cut the man-hour requirements 82%, on another we cut the man-hours down 80%, and on a third, 60%. Why, inside of two years, those trucks will have paid for themselves through these savings!

"MAKES OUR EMPLOYES HAPPIER, TOO. Their work is easier; and the 14 men who had been engaged in back-breaking manual labor were shifted to more productive work in the plant.

"ANOTHER THING; ELECTRIC TRUCKS ARE SAFE—they're fume-free, easily operated and present no fire hazard. And cheap to operate? Why, the maintenance costs are negligible, and down-time for repairs is practically nil.

"OUR STORAGE PROBLEMS WERE SOLVED by using electric trucks. We used to rent 60,000 square feet of space outside the plant, but now we can tier everything in unit loads right in our own warehouse. That represents a big saving.

"NO SIR, MISTER. We just couldn't do without our battery-electric trucks. And I'll bet *you* couldn't, either!"

YOU CAN FIND OUT A LOT MORE about battery-electric trucks from our new "Handbook of Material Handling with Industrial Trucks," priced at $2 each (or $1 in quantities); *but* you can get *your* copy free by writing your request to us on company stationery, stating your title or position. WRITE TODAY!

*Based on actual case study

THE *Electric* INDUSTRIAL TRUCK ASSOCIATION
3701-B NORTH BROAD STREET · PHILADELPHIA 40, PENNA

LABOR DEVELOPMENTS

Begins on page 214

BRIEF — BUT IMPORTANT

Labor lawyer's services are a contract cost. A government contractor under a cost-plus-fixed-fee contract is allowed by the Army's Contract Appeal Board to include a labor lawyer's fees as an item of cost. The lawyer represented the company in an NLRB case. The government's General Accounting Office had denied the sum. The Appeal Board's decision is final. *(Stewart-Warner)*

How thorough can the Wage-Hour Division be? Here's an example: In the eight months between January 25 and September 30, 1950, it found that 1032 firms in the New York City and Long Island areas violated the new 75-cent minimum wage or overtime requirements. They owed $483,000 to workers. In just this one area, about $14 million were found due to employees in the 12 years the Wage-Hour law has been in effect.

Veteran reemployment rights settled by agreement. The reemployment and other rights of the accounting employees of the Illinois Bell Telephone Company who enter military service have been determined by negotiation between the union—Communication Workers of America, CIO—and the company. The agreement sets up a military committee consisting of two management and two union representatives. Their job: to settle each problem that may turn up in administering the agreement. In case of deadlocks, a fifth impartial member is added.

The little gal wasn't so innocent. Because her efficiency was low, an employee agreed secretly with her boss that she'd work for less than union scale. Later on she changed her feminine mind, sued for the difference between her pay and scale. Got it too. Federal Court ruled her secret agreement was void—contrary to the employer's contract with the union.

Unemployment benefits are OK for Ford workers idled by strike. Remember the Ford strikes of almost a year ago? Ford's Detroit workers alleged speedup and walked out. Parts shortages then closed down two of Ford's New Jersey plants. N. J. workers claimed unemployment insurance. The N. J. Supreme Court now rules that their claims are valid.

A WIDE RANGE OF EQUIPMENT TO HELP YOU DO A BETTER JOB

Vertical and inclined Bucket Elevators with spaced or continuous buckets mounted on chain or belt. A complete line of standards.

in

FEEDING
CONVEYING
ELEVATING
REDUCING
DRYING
COOLING
PACKING
SCREENING

Belt Conveyors for handling a wide variety of loose, bulk material. Roller or ball bearing troughing (or flat) and return idlers for belt widths from 14" to 60". Large capacities and a steady flow.

Spiral Conveyors will handle many kinds of material with clean, dustless operation. No return strand. Standard types — also many special designs and applications. Interchangeable with other makes — built to industrial standards.

A complete line of Crushers, Pulverizers and Shredders for reducing most any kind of material to desired fineness.

Electric Vibrating Feeders provide absolute control over feeding operations. Open or closed pan, or tubular decks. Capacities from a few ounces up to many tons per hour.

Car Pullers for spotting from one to six cars. Two sizes.

Rotary Bin Check Valves —insure a constant, uninterrupted flow of fine flooding material to vibrating Feeders or WAYTROLS. Also Bin Level Indicators.

Rotary-type Feeder for feeding finely pulverized material. Also Spiral, Apron, Belt, Plate and electric-vibrating type Feeders.

Low Head Barrel Packer for economy in packing operations. Reduces size of containers, increases capacity and cuts shipping costs. Also supplied with deck to provide conveying action during packing operations.

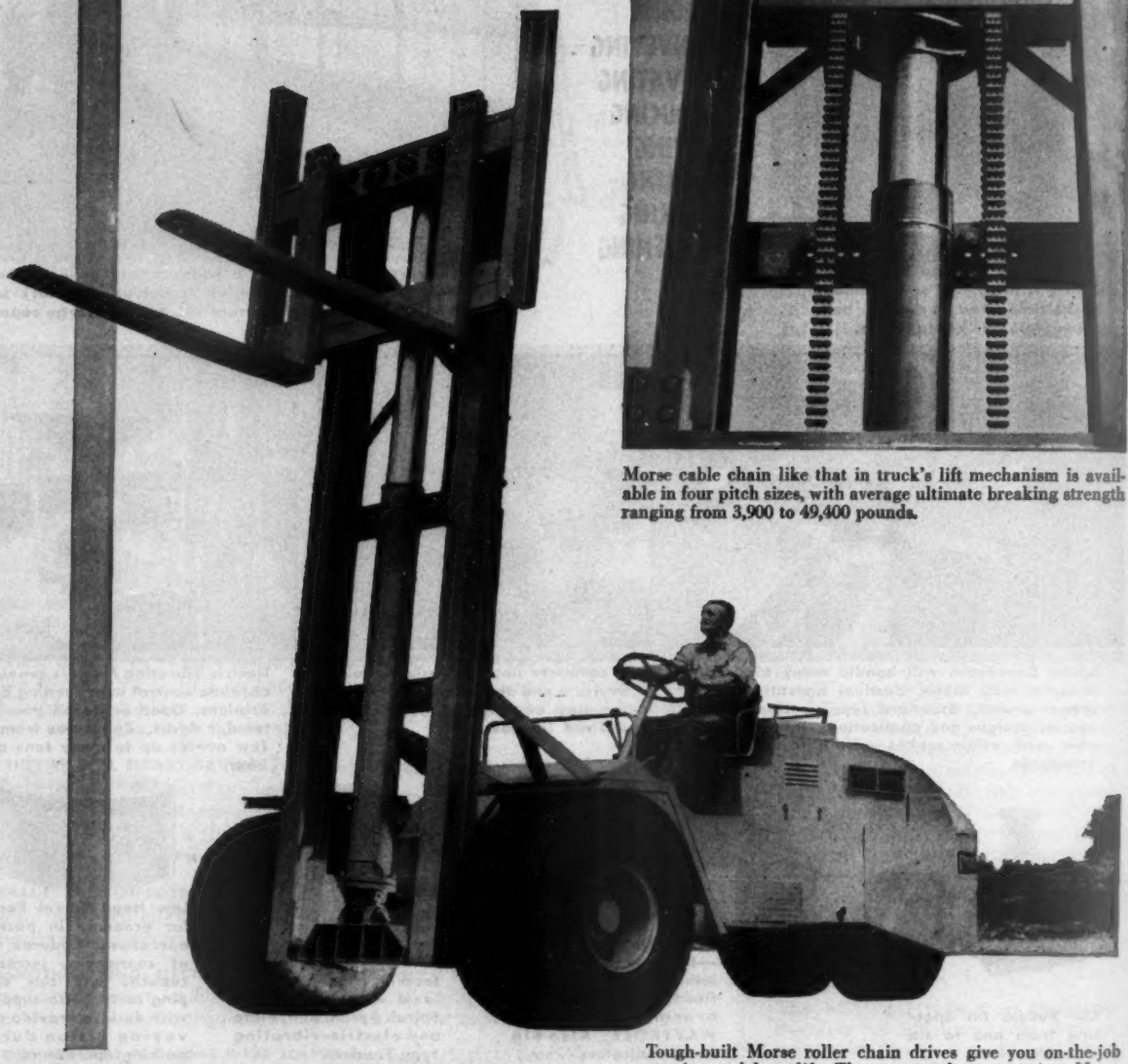
THE JEFFREY MANUFACTURING COMPANY

ESTABLISHED 1877

Complete Line of Material Handling, Processing and Mining Equipment

Giant fork truck

Morse cable chain like that in truck's lift mechanism is available in four pitch sizes, with average ultimate breaking strength ranging from 3,900 to 49,400 pounds.

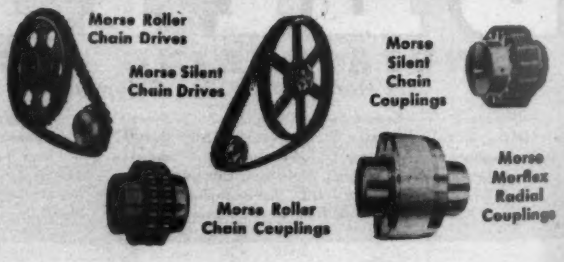


Tough-built Morse roller chain drives give you on-the-job stamina and long life. They use teeth, not tension. Morse roller chain drives are positive, can't slip. They are 99% efficient.

Ask the Morse Man for power transmission information!

100 Morse Branch Offices and Distributors to supply your power transmission demands.

From coast to coast there are more than 100 offices, representatives and distributors of Morse Power Transmission products to give you quick information and service when you want it—where you want it. *Ask the Morse Man first in any case!* Check your classified phone directory under **"Power Transmission"** or **"Chains"** for the nearest Morse Man.

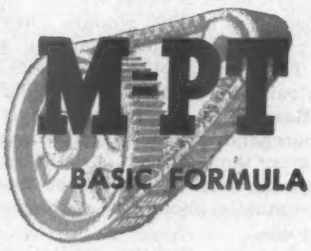

Morse Roller Chain Drives
Morse Silent Chain Drives
Morse Silent Chain Couplings
Morse Roller Chain Couplings
Morse Morflex Radial Couplings

gets lift from MORSE CHAINS...

THE huge Ross truck at left, world's largest on pneumatic tires, lifts, moves, and stacks a thirteen-ton, six-foot-wide load, ceiling high at low cost. Everything about this machine smacks of power, power, power. And transmitting power efficiently, safely, reliably are two types of Morse chain: Morse cable chains, in the lift mechanism; two Morse double roller chain drives, from the differential drive axle to the front wheels.

Whatever your power transmission problems — whether they call for cable chain, roller or silent chain drives, clutches, couplings, or drive shafts — turn to Morse as Ross has. For complete information, write

MORSE CHAIN COMPANY
Dept. 102 • 7601 Central Ave., Detroit 8, Michigan



Morse *means* Power Transmission

MORSE
MECHANICAL POWER TRANSMISSION PRODUCTS

PRODUCTS OF BW BORG-WARNER

YOU MUSTN'T MISS—

INDUSTRIAL NEWS, BEGINNING ON THIS PAGE

TIMELY HINTS TO BETTER MANAGEMENT ON PAGE 232

QUOTES FROM INDUSTRY'S READERS ON PAGE 236

IDEAS TO STIMULATE YOUR THINKING, ON EVERY PAGE

INDUSTRIAL NEWS

New Service Speeds L.C.L. Shipments

THE TWO PIECES of equipment illustrated above are saving time and money for shippers of L.C.L. (less-than-carload) freight. The "Speedbox" and specially designed car are used in a new service started by the Missouri Pacific Railroad.

Missouri Pacific customers have plenty to gain from the service. They can pack merchandise directly into Speedboxes, thus saving cost of packaging materials, time normally spent in packaging, and the transportation charges usually made on the weight of shipping cartons or boxes. Also, the metal containers keep the entire shipment intact. That means less expense resulting from lost or damaged goods.

How Speedbox Works • The railroad furnishes Speedboxes to the customer without charge. He packs in his merchandise. (There are no restrictions on packing method or type of freight handled.) Then he locks the Speedbox doors with an ordinary box car seal. Missouri Pacific transports container and contents intact to the consignee, who unlocks and unloads it.

There's no extra expense to the shipper for this service. He merely pays for the weight of merchandise shipped and not for the weight of the Speedbox. The railroad's only stipulation is that each Speedbox must be loaded with at least 400 pounds of freight. Less wouldn't pay.

The Speedbox—built of steel-reinforced aluminum—comes in two standard sizes. One is 4 feet high, 4 feet wide, and 3 1/3 feet deep. The other is 4x4x2 5/6 feet. Both have a load limit of 1200 pounds. They're built on casters to facilitate moving and turning. There's a foot-operated locking device to raise the casters off the floor.

Special Boxcars • To further improve L.C.L. merchandise service on Missouri Pacific lines, the railroad is building a fleet of special boxcars like the one shown above. Eventually, about 1600 of them will be put in use.

These cars are slightly smaller than ordinary boxcars. Their size permits proper loading and stowing of many small merchandise shipments, avoiding heavy top loading and reducing the chance of crushed or damaged freight. To reduce damage still more, "hitching posts" are built into the inside walls of the cars. They're designed to take strapping.

Special markings identify these cars and assure fast handling. Missouri Pacific employees are required to place them promptly for loading, handle them in fastest available freight trains, and spot them quickly for unloading.

More on next page

STRAN STEEL QUONSETS

provide valuable space, quickly and at low cost, as

FACTORIES • WAREHOUSES • MACHINE SHOPS • STORAGE BUILDINGS

Large Industrial Warehouse . . . 5 Acres for Storage

Proof of the usable floor space Quonsets provide—quickly—for industrial needs is this interior view of National Steel Products Company's new Houston warehouse. It covers five acres (see inset picture).

ALL-STEEL Quonset buildings offer the ideal solution to America's fast-growing need for quick, economical construction.

For large industrial installations or small, Quonsets give you a variety of sizes . . . in a variety of lengths . . . superior fire-protection . . . lasting durability.

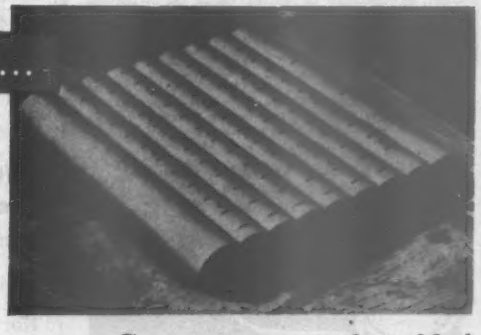
The amazing versatility of Quonsets was first shown in World War II . . . after V-J Day their fast erection and economy of material helped speed the nation's quick return to peacetime prosperity.

Now, more than ever, new and improved Quonsets are your best bet for all-round speedy construction. For full details, see your nearby Quonset dealer, or write direct to—

Built in 12 Weeks . . .

at Half the Cost!

Archie Furr, Lincoln, Neb., wholesaler, needed a new warehouse and office *fast,* at an economical figure. His multiple Quonset was completed for half the amount bid on conventional type building.



To Supplement Existing Structures . . . Quickly!

Quonset Multiple and Quonset 40 were chosen by Twin Coach Co., Buffalo, N.Y., to provide additional storage space and experimental manufacturing facilities. Flexibility of design and speedy construction make Quonsets ideal for factory additions.

GREAT LAKES STEEL CORPORATION
Stran-Steel Division • Ecorse, Detroit 29, Michigan

PRODUCER OF NAX

STRAN-STEEL AND QUONSET REG. U.S. PAT. OFF.

NATIONAL STEEL CORPORATION

Easily inspected and serviced. Just remove two bolts and tilt hood.

ACCEPTED

All Over America

Allen

HIGH-EFFICIENCY ROOF FAN

Companies* with ventilation problems as diversified as the products they manufacture are turning in increasing numbers to the Allen-engineered, power-driven, High-Efficiency Roof Fan. Rugged construction, low power consumption, ease of installation, ability to fit smoothly into various architectural styles, large air removal capacity, and *low* initial cost and maintenance recommend it to plant managers' attention. This Roof Fan efficiently removes air laden with heat, fumes, vapor, dust. Available in wide range of capacities (750 to 45,000 cfm), many sizes, and in Standard, Direct Drive, and Remote Drive types. Write for catalog on complete line of roof ventilators.

* *General Motors Corp., Dow Chemical Co., National Biscuit Co., Hughes Aircraft Co. —and many others.*

Representatives in principal cities are listed in our catalog in Sweet's Architectural File, Section 20b.

ALLEN Engineered Ventilation

PRODUCTION PLANNING CO.

ROCHESTER, MICH.

Roof Ventilators for Every Industrial Need

FILL OUT AND SEND COUPON

PRODUCTION PLANNING CO.
ROCHESTER, MICH.

Please send me informative literature on your complete line of roof ventilators.

Firm

Name

Position

Address

City, State

YOU MUSTN'T MISS—

Begins on page 226

Unusual Laboratory

Twenty-one miles of glass tubing make the "windows" of this unusual building. Dedicated last November 17th, it's the new home of Johnson Wax Company's laboratories, Racine, Wis.

Designed by Frank Lloyd Wright, the 15-story, 153-ft. high tower has hanging walls of brick and horizontal glass tubing that admit plenty of diffused light. They're supported by a hollow, steel-reinforced concrete core that also carries an elevator shaft, circular stairway, piping, wiring, fume exhausts, and ventilating ducts.

Floors are in pairs, 40-ft. square floors alternating with smaller circular floors. This permits installation of tall laboratory equipment and facilitates communication.

Radioactive Material Aids Study of Mixtures

Industry is beginning to realize the benefits it can gain from using radioactive materials in manufacturing operations. Take Quebec North Shore Paper Company, for example.

They recently used radioactive iodine to study pulp solutions and mixtures during the manufacture of newsprint. During the test they used one six-millionth of an ounce of radioactive iodine and produced about six acres of newsprint. They employed the simple "tracer" technique. They added a minute amount of radioactive material to the batch to be studied, then used Geiger counters to follow its progress through the various stages.

More on next page

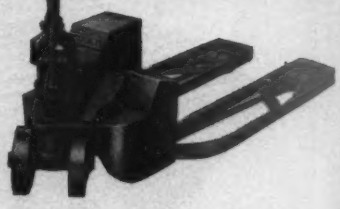
Be "COST-WISE"! PALLETIZE

WITH

Weld-Bilt

Pallet Type

HYDRAULIC LIFT TRUCKS



You'll handle a greater variety of pallets easier and faster with a WELD-BILT Pallet Truck! The slim, sturdy forks, with their greased-for-life ball bearing wheels, are designed to enter all types of single or double-faced pallets.

Some of the features that prove WELD-BILT extra value include: front wheel equalizer, accelerator type lowering pedal, multi-stroke hydraulic lift, "anti-kick-back" safety handle, instant-free handle release, shockproof mounting of hydraulic unit —and many others. They help you to time and labor savings, and promise longer service.

Write today for complete details on WELD-BILT Pallet Trucks, in capacities of 2,000, 4,000 and 6,000 lbs. . . . for "Cost-Wise" Palletizing. Bulletin 311.

Other Weld-Bilt Products—

- HYDRAULIC LIFT TRUCKS
- SINGLE STROKE TRUCKS
- PORTABLE ELEVATORS
- FREIGHT ELEVATORS
- SKID PLATFORMS
- PLATFORM TRUCKS
- TWO-WHEEL TRUCKS
- STORAGE RACKS

WEST BEND EQUIPMENT CORPORATION

MATERIALS HANDLING ENGINEERS

313 Water Street, West Bend, Wis.

NEW Easy to Clean Resists Corrosion

CORROSIVE ATMOSPHERES CAN'T HURT this Allis-Chalmers totally enclosed, fan-cooled motor because major parts are enclosed in a rigid corrosion resistant cast iron frame! No extra treatment is needed and cast iron's corrosion resistance won't chip off.

Lower Maintenance, Too

No corners, pockets or hidden air passages to collect dirt. Cleaning is the simplest of maintenance operations. Just blow off the dirt with an air hose. Fan and housing design keep cooling airflow tight against the yoke so dirt does not accumulate and cleaning is seldom required.

Factory Lubricated Bearings

Bearings are lubricated at the factory and operate without attention or cost for years. Extra rigidity of the cast iron frame holds bearings in true alignment under all operating conditions. This gives long bearing life and low operating costs.

Get All The Facts

The new *Safety Circle* totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224 to 505. Call your nearest Allis-Chalmers Authorized Dealer or Sales Office for complete information or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B6144. A-3228

Safety Circle, *Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

ALLIS-CHALMERS

Dependable FIRE PROTECTION...

STARTS WITH **ANSUL** *Water-tight* CONSTRUCTION

CUTAWAY VIEW, ANSUL MODEL 20-B

The new, improved Ansul Model "B" Extinguishers have the greatest fire-killing ratings* ever attained by hand portable fire extinguishers. In addition, WATER-TIGHT CONSTRUCTION, (exclusive with ANSUL) has resulted in far greater dependability than any other dry chemical extinguisher.

In fire protection equipment, the best is none too good. Accordingly, Ansul engineers conduct continuing research for improving Ansul Extinguishers and Dry Chemical. Ansul Quality has set a high standard for newcomers in the dry chemical fire extinguisher field. This unparalleled standard of quality is constantly being raised by Ansul research and development.

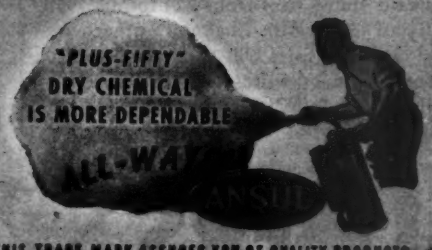
Send for File No. 602. You will receive a variety of helpful printed matter. Included is our latest catalog which describes Ansul Extinguishers of all sizes — from the small Ansul Model 4 to Ansul Piped Systems and Ansul 2000 lb. Stationary Units.

*Factory Mutual Laboratory Reports of Examinations and Tests.

Exclusive Features

- Patented Nozzle assures most effective stream pattern . . . Best results by inexperienced operators.
- Special packings in Nozzle and other parts exclude water.
- Corrosion resistant construction throughout.
- Easy on-the-spot Recharging (No tools needed).
- Quick, *positive* puncture operation.
- Special cartridge guard protects cartridge . . . rugged construction throughout.
- Ansul *"PLUS-FIFTY"* Dry Chemical used exclusively.
- Field tested by thousands of satisfied customers.

ANSUL
CHEMICAL COMPANY
FIRE EXTINGUISHER DIVISION
MARINETTE • WISCONSIN
DISTRIBUTORS
IN ALL PRINCIPAL CITIES IN THE U. S. A., CANADA AND OTHER COUNTRIES



THIS TRADE MARK ASSURES YOU OF QUALITY PRODUCTS

YOU MUSTN'T MISS—

Begins on page 226

Nylon Coil Form

You'd guess that a coil form made out of nylon rod would have good electrical properties. But did you know that nylon rod has good machining characteristics, too? The coil form shown above has 128 threads to the inch. The radio manufacturer who uses these coils says the nylon is tough enough to hold coiled wire in place permanently.

How Business Financed Expansion

Everybody knows that American industry has expanded since World War II. But not many people know how industry financed that expansion. So the National Association of Manufacturers decided to find out.

The result is a 31-page booklet entitled "Financing Business Expansion." Covering the 1946-1949 period, the study points out some interesting facts. For example, of the $60-billion spent by business for plant and equipment, less than half that amount represented actual growth. Some 56% was needed merely to replace worn-out or obsolete equipment. Allowances for depreciation weren't nearly high enough.

Retained earnings were an important source of funds, but the high level of retained earnings came from abnormally low dividends rather than exceptionally high profits. Despite business prosperity during this period, risk capital was hard to find. Only 5% of the funds that were needed for expansion came from new stock issues.

That'll give you an idea of what the study shows. It doesn't attempt to suggest a national financial policy for the future. Its aim is to acquaint you with the facts, so you can help shape that policy. For your copy, write NAM, 14 W. 49th St., New York 20.

More on next page

This man...

BRINGS YOUR WORLD TO YOUR DOOR!

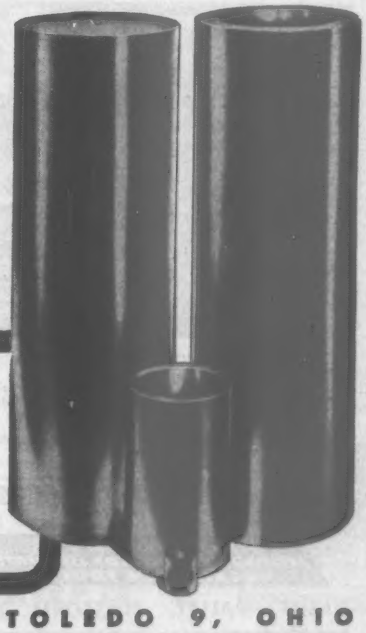
Three billion dollars worth of industrial equipment, tools, and supplies is quite an order even today. Yet there is a man in these United States who alone supplies to you and other customers approximately three billion dollars worth of such commodities every year.

Consider what it would cost in time, trouble and money every year for you and other manufacturers to find and bring to your plants this enormous quantity of things you use in your business.

Serviceable

"This man" is an industrial distributor or a specialist in certain industrial items. You will find him listed in the classified section of your telephone book—most likely under the heading Bars, bronze or Bearings, bronze. If he is the leading distributor, he almost certainly is the Bunting Distributor. He carries in stock for your money saving convenience Bunting Standard Stock Industrial Bearings, Electric Motor Bearings, and Precision Bronze Bars—ask him for catalog.

There are approximately 2,000 Industrial Distributors serving every industrial section of the United States. In 1948, their total sales were more than $3,000,000,000. They carry an average inventory investment of $500,000,000, turn their stocks over 5 to 6 times per year, fill 200,000 orders per day, have 12,000 outside salesmen and engineers, 10,000 inside telephone order expeditors, operate 8,000 trucks delivering merchandise on which their average net profit is .0292 cents per dollar of sales.



Bunting®

BRONZE BEARINGS • BUSHINGS • PRECISION BRONZE BARS

THE BUNTING BRASS & BRONZE CO., TOLEDO 9, OHIO

the VP hit the roof

The assembly line was clogged because grinding production slowed down. No wonder the V-P was sore. Don't let grinding inefficiency cause a frenzy in your plant. Check now. Changes in grinding wheels often multiply efficiency. Let a Simonds Abrasive Company engineer help you find out. He may be able to reveal unsuspected profit leaks in your plant. It costs you nothing and may save you plenty. Write.

EXECUTIVES — *Simonds Abrasive Company's complete line has everything you need . . . grinding wheels, mounted points and wheels, segments and abrasive grain.*

SIMONDS ABRASIVE CO.

Grinding Wheels

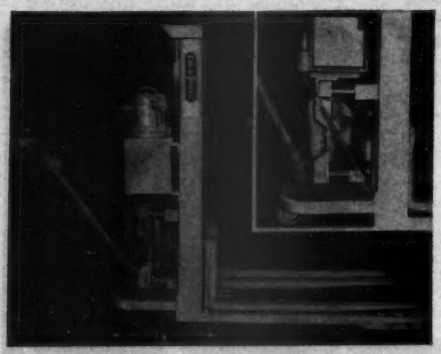
SIMONDS ABRASIVE COMPANY, PHILADELPHIA 37, PA. DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

The *Shortest* Hi-Lift

MOTORIZED, BATTERY OPERATED

WALKIE TYPE TRUCK *Built* DUE TO MOST COMPACT POWER UNIT



MOTO-TRUC "SHORTIE" MODEL TELESCOPIC HI-LIFT TRUCK.

Patented articulating hinged spring unit holds drive wheel down on floor.

Standard capacities: 3,000 and 4,000 pounds. Lifting heights: from 80" to 120".

15" to 20" shorter than other trucks of this type.

STACKS PALLETS FROM NARROWER AISLES—permits more space for storage.

EASIER TO OPERATE. Controls in easy grip roller type handle. No knife switches. No toggle switches.

POWERFUL MOTOR that operates for as little as 8¢ per 8-hr. day. Heavy duty 12-volt for level operation, 18-volt for continuous ramp duty.

FOUR POINT MOUNTING UNDER LOAD insures stability.

BRAKE MOUNTED ON DRIVE WHEEL relieves strain on chain and gears, insures safety.

WRITE FOR BULLETIN NO. 50, and Specifications.

The MOTO-TRUC Co.
1953 E. 59th Street
CLEVELAND 3, OHIO.
ORIGINATORS of MOTORIZED, BATTERY OPERATED WALKIE TYPE TRUCKS

HI-LIFT, PALLET, PLATFORM TRUCKS

YOU MUSTN'T MISS—

Begins on page 226

TIMELY HINTS

Small Plants Better Than Large Ones

At least that's what Don G. Mitchell, president of Sylvania Electric Products, Inc., says. He claims that small plants have advantages over large companies from the standpoint of labor and community relations, as well as in certain aspects of management.

In a speech at the November, 1950, meeting of the Society for Advancement of Management, Mitchell told how his company makes use of that belief.

He described Sylvania as a large small company. It operates "under a policy of decentralization of manufacturing wherein line authority is out in the field and functional authority stays at headquarters."

Sylvania has broken up its operations into small plants. All but five have less than 1000 employees. The smallest has 230; the largest, 2900. By doing this, the company gets flexibility, good employee morale, better community relations, and improved executive training through independence and responsibility. Then, too, said Mitchell, "Managers of small plants are much closer to their employees than large plant managers could be."

New Twist for International Trade

Making parts in foreign branch-plants and selling them in other foreign countries is nothing new. But what about selling those same foreign-made parts in America? It pays, according to Burroughs Adding Machine Company.

For example, Burroughs has a new plant in Scotland that turns out all the Burroughs electric calculator parts for the whole world. When present U.S. supplies of these parts are exhausted, new ones will have to come from Britain. *More on next page*

"Job-Engineered" means tailored to your crane needs

When you buy a crane, you want dependable service for many years to come. Your P&H "Job Engineered" crane will be built to meet your requirements to insure dependability . . . ample reserve capacity . . . adequate service factor . . . maximum safety. All P&H electrical equipment is designed and built by P&H for crane service — not adapted for it.

"Job Engineered" is an Added Value which comes with P&H's 65-year experience in crane-building — to serve your needs *exactly*.

And here's a fact worth remembering: P&H Cranes are sold and serviced by factory-trained men — not agents.

P&H Magnetorque* is the greatest advancement in AC crane control in the past 40 years. Ask about it.

*T. M. of Harnischfeger Corporation for electro-magnetic type brake.

Write for your copy of Bulletin C-39 describing P&H Magnetorque control.

P&H OVERHEAD CRANES
4525 West National Avenue
Milwaukee 14, Wisconsin
HARNISCHFEGER CORPORATION

EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • CRAWLER AND TRUCK CRANES • DIESEL ENGINES • CANE LOADERS • PRE-ASSEMBLED HOMES

OVER 17,000 P&H CRANES SERVE AMERICAN INDUSTRY . . . FAR MORE THAN ANY OTHER

HYDRAULIC CYLINDERS

AIR CYLINDERS

RIVITORS

CLINCHORS

CUTTERS

AIR CONTROLS

A tip for you on trimming costs—put T-J products to work in your plant! Engineered to *save labor* and give you *plus performance* in a wide range of applications.

For those "muscle jobs" of pushing, pulling or lifting—100 lb. or 50,000 lb.—save money by mechanizing with T-J Air and Hydraulic Cylinders! For high production in rivet-setting, specify T-J Rivitors with automatic feeding and setting . . . air or electric power. For setting clinch nuts in automotive body panels, door locks and other products . . . set 'em 3 to 5 times faster with T-J Clinchors! For more work between grinds in tough die steels . . . T-J Cutters! For accurate, automatic control of presses, brakes, other machines and equipment . . . T-J Air Controls.

That's it—get T-J *all the way* for tough jobs! Send for latest catalogs. The Tomkins-Johnson Co., Jackson, Mich.

T-J 34 YEARS EXPERIENCE
TOMKINS-JOHNSON
RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

YOU MUSTN'T MISS—

Begins on page 226

Committee Gives Advice on Use of Older Workers

"With the mounting tempo of the defense effort, and increasing demands by the armed services for younger employees, industry must rely more heavily on the older groups." So says Dr. Harold Lovell, president of the American Geriatrics Society. To help industry utilize older people more effectively and maintain their health, the Society recently formed a national advisory committee. Its services will be free to all industrial groups and labor unions.

Dr. Lovell lists the following advantages of using older workers in industry:

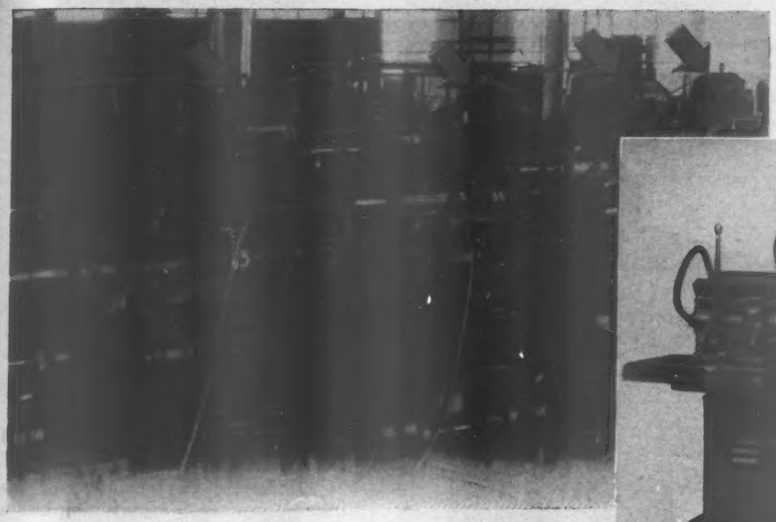
1. Old people are happier and in much better health when they are at work.
2. They are often more reliable than younger people.
3. It's possible to keep them at work even though they are handicapped by illness. Work, instead of retirement, puts them on a more independent basis, thereby reducing illness and the cost of illness.

New Tooling Method Can Cut Costs 30%

If your production operations require the making of big, but very accurate, fixtures, you'll want to check up on a new tooling method developed by Republic Aviation Corporation. The system is based on use of a line-of-sight positioner instead of mechanical measuring devices. Says Republic, "Rays of light are straight, do not wear out, and provide constant accuracy." The company goes on to say that its optical system:

1. Reduces the cost of tools, thus cutting cost of the end product.
2. Improves accuracy of assembly fixture construction.
3. Permits transportation of large fixtures in small units by air and makes stock piling in dispersed areas practicable.
4. Simplifies erection of fixtures, thus allowing rapid training of inexperienced workers to do the erecting.
5. Enables jig builders to erect accurate fixtures that can be interchanged without use of masters.

More on next page



Four Century 5 horsepower squirrel cage motors operate milling machines

Century 5 horsepower motor driving a grinder

Century

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SQUIRREL CAGE MOTORS

⅛ to ¾ horsepower

1 to 1½ horsepower

2 to 15 horsepower

20 to 125 horsepower

150 to 400 horsepower

Equipment Producers Select Century Motors To Give You Long-Life Performance With Least Down-Time

The correct selection of the right combination of motor type, speed, power, torque, frame and mounting keeps Century motors on the job; reduces production headaches.

Team work between your motorized equipment producers and Century motor engineers means that you always get the right motor—selected from Century's wide range of types and kinds, in sizes from ⅛ to 400 horsepower for single or polyphase alternating current and direct current. You can be confident that you get top performance from the fine equipment these motors drive.

Skillful application makes sure that Century motors meet the exacting requirements of the machines they drive. That's your assurance of dependability.

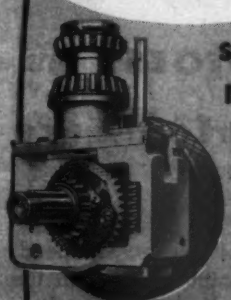
CENTURY ELECTRIC CO. 1806 Pine St., St. Louis 3, Mo.

Offices and Stock Points in Principal Cities

CE-690M

Specify Century C MOTORS for all your electric power requirements

"Don't overlook a look under!"

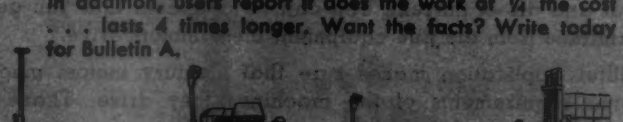


see why the Stuebing Hydrolectric needs only ¼ average maintenance

It pays to "get to the bottom" of lift truck maintenance problems. The smart truck buyer knows the heart of a lift truck is the drive and makes sure he gets the best, most dependable drive available.

Only in Stuebing Hydrolectric do you get this rugged construction . . . this positively trouble-free service . . . the Stuebing True Differential Drive. Alloy steel gears and running parts are sealed in lubricant. Old style chain drives are eliminated.

Of course the Stuebing Hydrolectric saves up to 80% on time and work in material handling. But, remember, in addition, users report it does the work at ¼ the cost . . . lasts 4 times longer. Want the facts? Write today for Bulletin A.



Lift Trucks Incorporated

2425 Spring Grove Avenue
Cincinnati 14, Ohio

YOU MUSTN'T MISS—

Begins on page 226

QUOTES

Heard at SAM Conference November, 1950:

"Successful performance of the management job today requires a double skill. The technique of organizing and controlling employees has become a science. Reaching them as individuals to insure that they accept the process is an art."

E. H. VAN DELDEN, *Professor of Industrial Relations, New York University.*

"We believe in a realistic approach to reducing costs and find one of the best ways is through paying the supervisors a bonus in terms of their ability to reduce costs. Foremen in one plant have operated on an incentive system based on cost control for 10 years or more, and we are currently in process of adding a new group, in addition to getting broader expense coverage into the plan."

GEORGE C. HOUCK, *assistant to the president, Harris-Seybold Company.*

"Today, as in the past, there is still a large group of literary and "social-minded" people who believe that civilization as we know it may well be doomed to extinction because of the malign influence of the machine."

DR. MORRIS S. VITELES, *director of personnel, research, and training, Philadelphia Electric Company.*

"In this nation the era of management-worker strife is slowly coming to an end, and, strange as it may seem, I am convinced that we will one day see the phenomenon of free unions operating in aggressive support of private management. Because only with private ownership and management can there be strong and successful labor unions."

GEN. ROBERT W. JOHNSON, *chairman of the board, Johnson & Johnson.*

More on next page

6-cell lead-acid or 10-cell nickel-alkaline

45-amp charging rate

Model No. 6RS951A2

6-cell lead-acid or 10-cell nickel-alkaline

75-amp charging rate

Model No. 6RC161F1

All these chargers operate from either 115 or 230 volts, 60 cycles, single phase. They have an efficiency of about 70 per cent.

10-cell nickel-alkaline only

60-amp charging rate

Model No. 6RC160FE5

6-cell lead-acid or 10-cell nickel-alkaline

90-amp charging rate

Model No. 6RC149F1

BATTERY CHARGERS for Driver-lead type trucks

Metallic rectifier type chargers—Nothing to wear out. Only moving part is a small fan (model 6RS951A2 does not have a fan). Rectifier stacks have virtually unlimited life. Blowing out dust approximately once a year is the only maintenance they normally require. Easy to install. Easy to move from place to place.

Easy to Use—Batteries can be charged right in the truck. Easy to connect. Just plug in the cable—the charger does the rest automatically.

Your truck agent—can give you information on these General Electric battery chargers. Or write Section 463-3 for particulars. *Apparatus Dept., General Electric Company, Schenectady 5, N.Y.*

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463-8

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aid for plant maintenance men

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SOLID STEEL BASE
USE JACK IN HORIZONTAL POSITION ARROW MUST POINT UP
HEIN-WERNER HYDRAULIC JACK

HEIN-WERNER HYDRAULIC JACKS

. . . make pushing and lifting jobs easier

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These easy-operating, super-powerful jacks can be used to move, lift or push machinery, equipment, stock bins. Also can be used for pulling gears and pinions, bending pipe and pressing bushings.

Made in models of 1½, 3, 5, 8, 12, 20, 30, 50 and 100 tons capacity... Hein-Werner also makes "Push and Pull" Hydraulic Jacks of 4, 10, and 20 tons capacity . . . See your industrial supply distributor or write us for details.

HEIN-WERNER CORPORATION • WAUKESHA • WIS.

YOU MUSTN'T MISS—

Begins on page 226

How to Expand Industrial Capacity

"This time, we can't look for any such expansion of industrial capacity as we saw from 1940 to 1945. In 1940 this country had many idle resources to draw on. Much of our apparent expansion in productive capacity was really just a matter of putting idle facilities to work.

"1950 is different. Although our productive machine is much bigger, it is running at nearly full capacity, the labor situation is tight, and you'd have to look a long time to find idle facilities.

"We'll be able to squeeze a little more out by hiring housewives and lengthening the work week—which is expected in 1951. But by and large, all of our labor force is already at work and any significant increase in output will have to come from increasing the productivity of the people now at work."

Chester H. Lang, vice president, General Electric Company, speaking before the Chicago Power Conference.

Factory Management and Maintenance is a consolidation of *Factory and Industrial Management* and *Maintenance Engineering.*

Factory and Industrial Management grew from consolidations, mergers, or absorptions involving the following publications: *The Engineering Magazine; Industrial Management; Factory, the Magazine of Management; Management Engineering; Administration; Management and Administration; Management and Administration in Manufacturing Industries; Manufacturing Industries.*

Maintenance Engineering grew from consolidations, mergers, or absorptions involving the following publications: *Review of the Telephone and Telegraph; Electrical Review; Western Electrician; Electrocraft; Electrical Engineering; Electrical Review and Industrial Engineer; Industrial Engineer; Industrial Engineering; Industry Illustrated.*

In addition, features of the publication *Timely Ideas* have been added.

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C—*Model 7015 Short Grinder* . . . 21,000 r.p.m. . . . wheel capacity 1-1/2" . . . weight 1-3/8 lbs.

D—*Model 7149 Short Grinder* . . . 17,000 r.p.m. . . . wheel capacity 2" . . . weight 2 lbs.

E—*Model 7171 2" Heavy Duty Production Grinder* . . . malleable housing . . . 18,000 r.p.m. . . . weight with guard and handle 4 lbs. 11 oz.

F—*Model 7011 Heavy Duty Grinder* . . . 4500 r.p.m. . . . 8" wheel . . . weight less wheel guard and wheel, 13 lbs. Also available 6000 r.p.m. for 6" wheel.

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The Labor Relations Picture—Seen From Both Sides

► The author of this article has had intimate knowledge of both union and management philosophies, as union official and now as foreman in one of the country's leading firms. He offers no short-cuts or "cure-all" solutions of labor-management problems. But his conclusions give an insight into labor-relations thinking at the shop-operating level that is worth study.

► The author has asked to remain anonymous to avoid the risk that his frank comments might impair the good relations he has with the men under him in his plant. FACTORY has checked with his company, and can vouch for his sincerity and his abilities as foreman—*The Editor.*

By a Union Leader Turned Foreman

I have traveled around quite a bit and been a member of ten different unions. In eight of them I was an official of one sort or another. This has given me a broad view of the pattern that unions follow in different industries.

While I was an executive board member in one of the CIO unions, I was offered a job as foreman in the company for which I was working. After some discussion with the union committee, I decided to resign from the union and accept the position. The theory that I was about to test was:

Can a person with an extensive union background become a good foreman and a fair representative of management?

In this article are some of the answers I have come up with.

The Basic Difference

I have come to the conclusion that there is no basic difference between the representatives of unions and managements on a day-to-day basis in labor relations. A union leader who changes over, as I did, finds himself in the same position as an attorney: On the one hand, he may do everything in his power to defend a man who committed a crime, and as a district attorney, would do everything in his power to send the same man to jail.

I did find that, after being a representative of a union, it was tough on my sense of loyalties to become a representative of management. But it soon became apparent that there was very little difference on either side. It depended on which you were connected with.

I think that my union background made me think more carefully before I made decisions. The reason for this could be that during my union experience I had run into too many cases of snap judgment by foremen that caused no small amount of trouble.

I think that my personal background helped, too. I come from a small town in the coal regions of Pennsylvania where unionism becomes a part of you in very early life. You hear it in the schools; you hear it in the home; and you hear it discussed at public functions. It is a topic of conversation in almost any activity that you can mention.

The education gained from living in such an area becomes very valuable later on. It gives you a deep insight into the operations of union activities.

Importance of Anticipating Union Tactics

After attending numerous management conferences, I found that management had overlooked a powerful weapon in their arguments with union representatives. For example: It is well known that an executive board composed of five men in any union can, if they so desire, incite enough resentment against a company to cause the employees to go on strike.

The issue is unimportant. They can take any grievance, however

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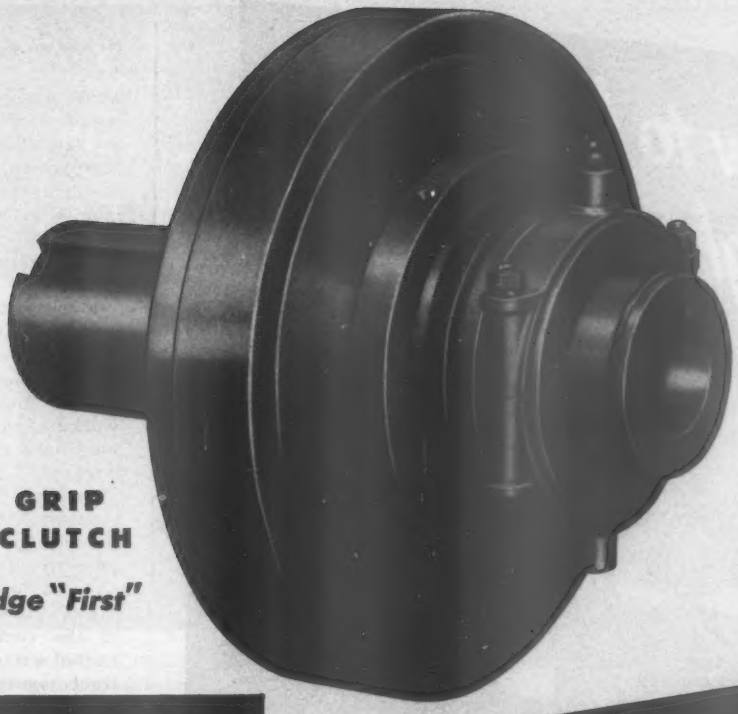

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Portable Air and Electric Tools for Industry

Begins on page 240

small, and build it up into a major crime on the company's part. By the same token, in any given group of foremen, the company usually has at its disposal a small group of men who have established themselves as able leaders through honesty and fair play with the workers.

If the company were to use these well-thought-of foremen to match the union, man for man, with a program to counteract the propaganda the union committee is feeding the workers, the union would find it very hard to incite the people to a walkout.

Analysis shows that the methods employed by the union in keeping the loyalty of their people should in many cases be the same methods adapted by management.

I saw an example of this recently in the company that I am connected with. The union, during contract negotiations, was not making much headway with the company representatives because of the financial position the company was in at the time. There had been only one strike in the history of the company—and it had only one explanation: It was fashionable and popular to go on strike at least once after the war was over.

This one incident of labor trouble, when analyzed by both sides, appeared to be childish to say the least. The lesson learned from it was still fresh in the minds of the employers and employees when the union committee decided to use what they thought was good strategy to speed up contract negotiations. At the suggestion of the national representative, the executive committee circulated the argument that if the negotiations did not show a more favorable trend for the union, there would be only one alternative: a walkout.

The company alerted its supervisors to follow the trend of thinking among the union people. Immediately the foremen picked up from the underground that there was no sincerity behind the strike movement; it was intended just to throw a scare into the company. They also learned that the vast majority of the employees were definitely against any kind of labor trouble; so that, instead of strengthening the union's position, the strike threat weakened it.

More on next page

To process TV tubes, Du Mont's C.R.T. Division in Allwood, N. J., must bake them out at high temperatures while passing through a long tunnel-type oven on costly high-vacuum tube pumping units. Substantial savings are realized by equipping these units with Bassick Grooved-Wheel Casters and moving them on angle iron track.

Bassick Grooved-Wheel Casters move heavy loads quietly and rapidly. Available in 4 in., 6 in., 8 in. and 10 in. sizes, swivel and rigid.

Du Mont proves materials-handling costs are the Reducible 30%!

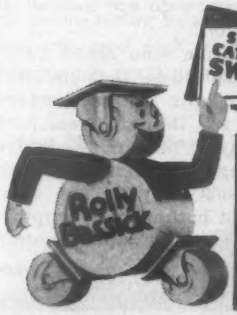
Du Mont's unique use of Bassick Casters proves materials-handling costs *can* be reduced. Like Du Mont, you'll find it well worth your while to look into this cost-saving opportunity. For though such expenses as wages, taxes, plant overhead are mainly fixed, cost analysts point out that materials-handling (about 30% of total cost) is still possible to cut. MORAL: There's extra profit awaiting you in the "Reducible 30%."

Here's a cost-cutting angle on the Reducible 30%

If you handle materials frequently in the same direction, you'll save time, labor, wear on floors and "rolling stock" by doing as Du Mont and other top companies do . . . use Bassick Grooved-Wheel Casters on angle iron track.

Investigate Bassick's complete array of time-and-maintenance saving helps . . . "FLOATING-HUB" shock-absorbing casters, position locks, heavy-duty casters, the new "Alcore" rubber-tread aluminum wheels, the amazing new "Flying Saucer" caster, etc.

For information on these products, write to THE BASSICK COMPANY, Bridgeport 2, Conn. Division of Stewart-Warner Corp. *In Canada:* Bassick Division, Stewart-Warner-Alemite Corp., Ltd., Belleville, Ont.



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Begins on page 240

This is just one of many instances where the company can, through proper selection and training of their supervision, match the union, stride for stride, in any move they ever make. The first line of defense any company has during contract negotiations, or at the start of any grievances, is its foremen.

Foremen can detect, long before trouble shows up, any rumblings of discontent that may exist. And if they are familiar with the union's policies or have been trained in how unions usually operate, they can take the necessary steps to quiet the discontent, or notify the company of what is coming and prepare it for any eventuality.

I have noted this during some negotiations: Unions have gained more than the company actually had to give, because management people did not have the proper information coming back to them as to what the rank and file of the union would or would not have settled for. I cannot emphasize too strongly how important it is to have supervision tuned to the minds of the fair-thinking union employees.

Of course, in any group of people, you will run into crackpots and radicals who would not be content even if the company were to turn over the keys of the building to the union. You will find another group who would not care if the union or the company ever gave them any benefits. But, the large majority of union people can be convinced with sound arguments.

Importance of Communications

I recently attended a management conference with some of the top executives of a large electrical manufacturing company in the east. One of the men asked a few questions which seem to be in the minds of most employers today. Why don't our employees like us? What do we do to cause the mistrust and lack of faith they have in us? Why is it that really constructive things which we try to do are looked on with suspicion?

The executive who asked these questions, had these facts pointed out to him: His company never thought to tell its employees how much money it had invested in a new building that would give work to about 4000 people. The company did not bother to let employees know that it cost approximately

More on next page

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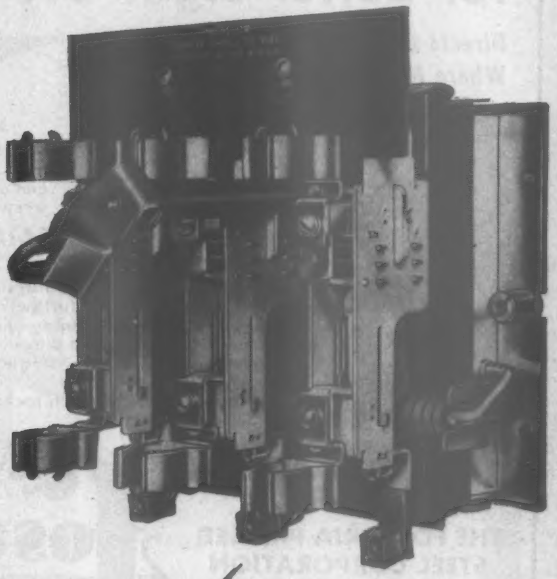
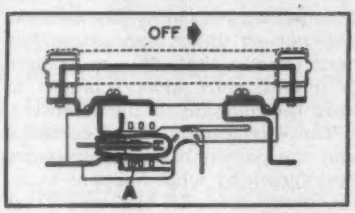
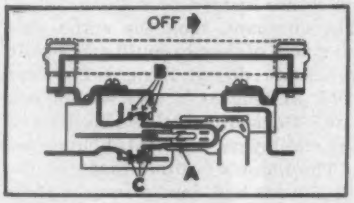


Unusually high interrupting capacity... "circuit-breaker" action breaks heavy loads quickly, safely. Extremely high momentary current capacity... withstands heavy short circuits without damage. 30-, 60-, 100-ampere sizes.

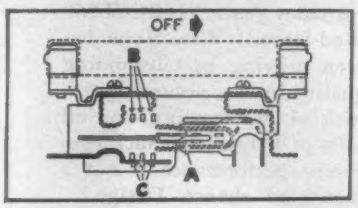
Here's How...
HCI's "Circuit-Breaker" Action Works



1. Switch closed. Spring-loaded sliding contact (A) fully inserted between stationary contacts. Heavy line is current.



2. Sliding contact being withdrawn. The two arcs repel each other, are drawn against grid pins (B) and (C), which break and cool them.



3. Contact fully withdrawn. Trumbull's unique "Circuit-Breaker" action has effectively extinguished the arcs.

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Begins on page 240

$10,000 per employee to build and equip a building of this kind. The company did not bother to tell employees that it could supply equipment to people in remote parts of this country, which would make their lives easier and create more employment for their families. Companies, as a general rule, do not reveal half the things that they could to their employees.

Union Attitudes and Tactics

Unions feel they must continually give some benefits to the employees they speak for. If they don't they put themselves in the same position as a person who subscribes for a magazine which he suddenly tires of, and doesn't read. The union that can't keep the workers in continuous anticipation of attained benefits will soon become impotent. Union leaders believe this, regardless of what approach a company may take.

It is also union policy to question the company's intent, and in so doing, to spread a kind of propaganda that sounds good to the dues-paying members. My own experience on union committees has been exactly that. We, as leaders of unions, were always taught to keep the company on the defensive.

The way leaders of unions think and the personalities involved are best shown by what happens to arbitration cases. In one case I sat in on as a union representative, the dispute that was being arbitrated arose from the refusal of a group of inspectors to check automatic screw machine work at the machines instead of at the benches. The company took the stand that no group of people could arbitrarily refuse to do anything they were told, as long as it was within reason. Consequently it discharged the employees, and sent them home.

The union's position was that the employees had done wrong in their spontaneous refusal. But they argued that the company's approach to the matter was so abrupt that it left the employees with no alternative but to refuse the request. The case was taken to arbitration. We on the union committee knew that we were in a tight spot as far as the general merits of the case were concerned. So we decided to rely on an appeal to the

More on next page

STOP RUST

FREE SURVEY: Place your rust problems in the hands of a RUST-OLEUM specialist. He will survey your plant for all rust problems, submit detailed recommendations, and make specific tests.

You can stop rust with RUST-OLEUM! An exclusive formula proved in a wide range of industrial and marine applications for more than 25 years. Its tough, pliable film dries to a firm rust-resisting coating that protects against rust—cuts maintenance costs—adds years of use to many metal surfaces, indoors and outdoors.

RUST-OLEUM may be applied over rusted surfaces without removing all the rust, assuring substantial savings in preparation time... It is only necessary to remove all the rust scale and loose rust.

Prompt delivery from Industrial Distributor stocks in principal cities. See *Sweets* for complete catalog and nearest source of supply, or write for complete literature on your company letter head today!

Beautifies AS IT PROTECTS

Available in many **COLORS,** aluminum and white

RUST

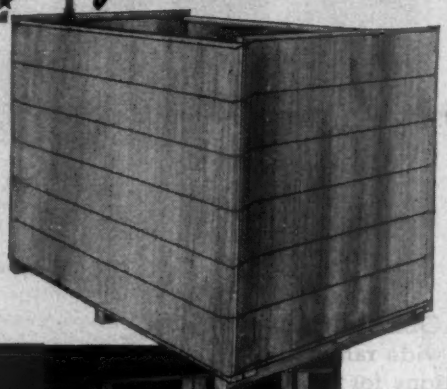
"Rigid Economy, Mon"

RUST-OLEUM CORPORATION

2451 Oakton Street, Evanston, Illinois

G-J-S E-202 Mill and Factory—January, 1951 (and others)

Generalift pallet boxes provide...



THE ANSWER TO MATERIALS HANDLING PROBLEMS...

...AND THE ANSWER TO STORAGE PROBLEMS

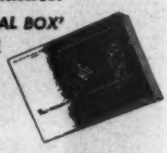
FOR LARGE BUSINESS

FOR SMALL BUSINESS • FOR ALL BUSINESS!

The Generalift Pallet Box is new . . . it has had a truly amazing acceptance among practically all types of manufacturers! It sharply reduces costs because *one* workman, fork-lift truck, and Generalift Pallet Box, do the work of many! If you are interested in sharply cutting your materials handling and storage costs, write today for complete information on this versatile container.

WE WILL MAIL FREE COPY OF "THE GENERAL BOX"

This colorful booklet illustrates and describes the many advantages of the Generalift Pallet Box. We will be glad to mail upon request.



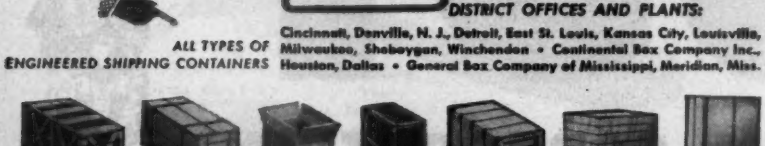
General BOX COMPANY

engineered shipping containers

GENERAL OFFICES:
504 N. Dearborn Street, Chicago 10, Ill.

DISTRICT OFFICES AND PLANTS:
Cincinnati, Denville, N. J., Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, Sheboygan, Winchendon • Continental Box Company Inc., Houston, Dallas • General Box Company of Mississippi, Meridian, Miss.

ALL TYPES OF ENGINEERED SHIPPING CONTAINERS



General Wirebound Crate | General Nailed Box | General Corrugated Box | General Cleated Corrugated Container | General All-Bound Box | Generalift Pallet and Pallet Box | General Watkins-Type Box

Begins on page 240

human side of the arbitrator for a favorable decision. The strategy of the union committee was followed very closely by everyone concerned. We agreed with everything the company said. We admitted the people were guilty.

But then we said that it was wrong to move somebody, without any preparation, from a comparatively safe distance from a machine and put him along side a machine that was operating at high speed, and was oily and noisy.

One of the members of the union committee said to the arbitrator, "It's very easy for me to stand on a chair and paint the ceiling of a room in my home.

"But, I find it much harder to reconcile myself to painting on a scaffold, that is just as wide and just as sturdy as the chair, if the scaffold is 50 feet above the ground."

The reaction of the arbitrator to this type of appeal was immediately apparent. After some more bickering back and forth, the union rested its case, and the arbitration decision was handed down. To use the arbitrator's own words, it was a case of "para delecti," or, in other words, equal guilt.

The Value of Sincerity

In another case I have in mind, I sat in as a representative of management, and was directly responsible for discharging the chief steward of the union. You can guess what the union was thinking of me—a former official who had suddenly turned around when I became a foreman, and discharged one of the key figures of the union committee. In this case the union brought in legal talent—an attorney for the district organization.

The attorney had a very good reputation as a trial lawyer. He tried to show I was anti-union to prove that the discharge wasn't justified. But here is an example of how management sincerity can be a big stumbling block for any union. It was true that I could have been anti-union. I had served as a committeeman, and defended in arbitration members of the same union. Now I was guilty of discharging one of the key men.

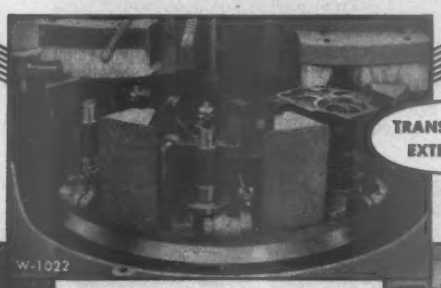
These arguments began to look weak, however, when I pointed to my record as a union representative and also to the record I had

More on next page

NO. 16-A2 AUTOMATIC

This two-spindle surface grinder is a real producer. In a single pass, the work is roughed by one wheel and then finished by the second wheel. Because each wheel can be selected for its part of the grinding operation, without having to compromise between roughing and finishing, the No. 16-A2 is particularly suited to work requiring high production. Close limits are assured by automatic size control for each wheel. If you're looking for maximum results with minimum effort, get production details on just how fast your own work can be done on the No. 16-A2.

Send blueprints or samples — there is no charge or obligation.



PINION CARRIER BEARING CAPS

These cast iron caps are placed in suitable stations, automatically clamped, ground, and automatically unclamped. 1020 caps per hour are ground to ±.003", and flat to .002" in a 20 station fixture. 1/16" of stock is removed per side.

The joint face is ground by loading the cast iron part over a post, locating from a shoulder, supporting the flange by a spring bunter. It is clamped automatically. Parts are held flat to .001", square with bore to .002", and to ±.001" for size. 84 pieces ground per hour on one side.

REAR AXLE PINION CARRIER

These cast iron parts are loaded with the flange under a "U" shaped block, clamped upward against the block. The four bearing surface "feet" are ground to limits of ±.003", parallel to flange within .001". 229 pieces are ground per hour on one side.

Send for your free copies of "Work Done on the Blanchard," third edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

ANY Electric Truck can be Equipped with READY-POWER

CONTINUOUS DUTY
GREATER EFFICIENCY
LOW OPERATING COST
LITTLE MAINTENANCE

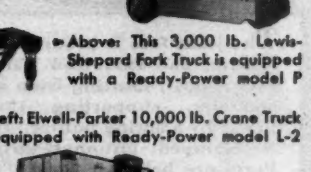
Only Ready-Power Gas-Electric Units provide efficient electric truck operation *continuously*. Because power is generated right on the truck chassis there are no limitations . . . no slow-downs. Ready-Power Units are famous for operating economy, too. There are models to improve the performance of all types and sizes of electric trucks.

Above: The new Ready-Power model H-A powers a 4,000 lb. Baker Ram Truck

Above: Ready-Power model J gives this 30,000 lb. Baker plenty of power for handling heavy steel coils

Above: This 3,000 lb. Lewis-Shepard Fork Truck is equipped with a Ready-Power model P

Left: Elwell-Parker 10,000 lb. Crane Truck equipped with Ready-Power model L-2



Right: Ready-Power model H powers this 4,000 lb. Mercury Fork Truck

THE READY-POWER CO.

3820 Grand River Ave., Detroit 8, Michigan

Begins on page 240

established since becoming a member of management.

The facts introduced into the case, in spite of all arguments that it was strictly a witch hunt, convinced the arbitrator that the discharge was justified. The decision handed down criticized the union quite severely for tolerating officials of this kind.

Union Officials—Source of Talent for Management

It has often been a practice in the past for foremen to be selected for their skill in the particular job they were doing rather than for their ability as leaders. This is shortsighted. It has been proven time and again that you do not have to be an engineer to run a railroad. Nor do you have to be a first-class toolmaker to take charge of a toolroom. Technical advice can be easily received from the related departments in any large organization. But the personality and leadership to handle people, keeping them content with a minimum amount of grievance, is a characteristic that all men do not have.

There are some pretty clear thinking men, even today, in a lot of unions that would make excellent foremen and executives if they were singled out and given the opportunity. It stands to reason that men who are elected to fill offices in unions, in most cases are natural leaders. Companies that avail themselves of this talent find themselves with men who can anticipate what is likely to happen and can set up proper defenses.

Furthermore, most union leaders that I know who have gone to the side of management have retained in a large measure the respect and friendship of the men who elected them to office when they were union representatives. It has not been uncommon in my case, and in other cases that I know of, for union men to ask for advice on problems concerning the company, or as to what stand they should take in regards to contract amendments being negotiated between the company and the union.

There is no chance that unions will, after a time, tire the people and lose their driving force. They are as much a part of the over-all picture as management is. The only way to keep them in balance is to understand why they act and think as they do.

New flexibility!

BullDog Unit-Versal® Vacu-Break Switchboards

Completely interchangeable, flexible Service and Distribution sections to meet every immediate and future need.

New Unit-Versal Vacu-Break Switchboards provide unequaled *flexibility* and *interchangeability* plus the exclusive Vacu-Break principle of arc control for longer switch life. Write today for Bulletin 496. It contains complete information on these remarkable, new switchboards.

BULLDOG ELECTRIC PRODUCTS COMPANY
DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

Simple to wire. Only a screwdriver and crescent wrench are needed to assemble, install, extend or convert these modern switchboards. Removable front plates provide quick access to large wiring gutters at top, bottom and both sides.

Large mounting space. More than 5½ feet of vertical mounting for branch circuits. Blank filler plates cover unused space and allow for future unit additions. All sections and units can be interchanged quickly and easily.

Complete Distribution Sections. Distribution Sections accommodate the full range of interchangeable ET Circuit Breakers and fusible Vacu-Break switch units—15-ampere to 600-ampere capacities.

Complete Service Sections. Service Sections include space only for meter and current transformer. They also include riser bus and Main ET Circuit Breaker or Fusible Vacu-Break Switch in capacities of 225, 400, or 600 amperes or Main Air Circuit Breaker of 800-, 1200-, or 1600-ampere capacities.

Extremely flexible. New Unit-Versal Service and Distribution sections may be used individually or combined into multiple-section switchboards. Sections may be added or removed as needed.

Vacu-Break Switch Units or ET Circuit Breakers (as indicated) may be used as Mains in Service Sections. Vacu-Break Switch Units are Horsepower-rated and approved by Underwriters' Laboratories.

BULLDOG

PIONEERS IN FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS

PANGBORN
Hydro-Finish

Prolongs Die Life!
Saves Labor!
Eliminates Emery Cleaning!

**for Rockford Drop Forge Co.
Rockford, Illinois**

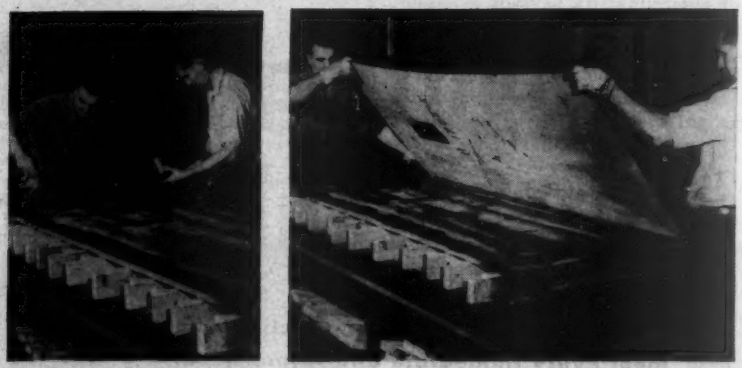
HYDRO-FINISH increases die life for Rockford Drop Forge by eliminating surface-disturbing emery cleaning at end of runs. Hand polishing is cut to a minimum because it's done *before* heat treating. Hydro-Finish removes all heat-treat scale, holds tolerances and leaves surface smoother than hand polishing. Estimates show Hydro-Finish will pay for itself out of savings in two to three years!

HYDRO-FINISH simplifies manufacture and maintenance of tools, dies and molds. Costly hand work is reduced and surfaces are virtually free from directional grinding lines. Hydro-Finish assures better bonding, electroplating, painting—gives you *the surface you want* within .0001"!

FOR FULL INFORMATION on how Hydro-Finish can save you money, write today for Bulletin 1400A to: PANGBORN CORPORATION,, 2100 Pangborn Blvd., Hagerstown, Maryland.

Pangborn
**BLAST CLEANS CHEAPER
with the right equipment
for every job**

NEW MATERIALS



Bonding together steel elevator door layers at Otis Elevator Company is one of many jobs done by versatile new group of . . .

Triple-Function Resins

FOR THE FIRST TIME since their introduction in Europe some five years ago, ethoxyline resins are being made in the U.S. Manufacturers are already finding many uses for them in three basic fields: bonding, casting, and coating.

Ciba Company, New York, makes the resins under the trade name Araldite. All of the resins harden to form thermosetting compounds without evolution of water or volatile matter. Low-pressure "bondability" is another property. Contact pressure is usually all that's needed. The resins have high resistance to corrosion, acids, and alkalis, adhere well to metals, ceramics, and other materials.

Araldite exists in three basic forms: bonding, casting, and coating resins. Here's a check-list of what various types can do:

Type 1 Thermosetting Adhesive is used mostly for bonding metal to metal, glass to glass, or metal and ceramics to metal. You can also use it to bond other heat-resistant materials. Comes as a powder or in stick form. You warm the parts to be bonded, rub on the resin, and keep the parts warm until it sets.

Liquid Adhesive Type XV has similar uses, but its liquid form adds special applications. It comes in a solvent. You spray, brush, or dip it on parts, then dry them to remove the solvent. Once dried, you can store the parts up to six months before bonding.

Cold Setting Adhesive Type 101 sets without material shrinkage. This makes it especially suitable for cementing metal to plastic. When mixed with aluminum oxide, you can use it as a surface smoothing compound. User prepares Type 101 just before using by adding a hardener.

Type 102 Adhesive is a thin liquid that sets at room temperature. Properties resemble Type 101. Can be used in bonding cloth to plastics, metal to plywood, abrasives to paper.

Casting Resin Type B is solid at room temperatures, melts at 220-250 degrees F. To prepare it for casting, you add a hardener. Sets without pressure. Good for making large castings in simple molds. High dielectric strength, humidity resistance, and affinity for metals suggest electrical applications.

Surface Coating Resin 985E is tasteless, odorless, and inert, suggesting use as liner for cans and collapsible tubes. Adheres to most metals without primer or special surface treatment. Resists alkalis, most acids and solvents. Goes on by dip, spray, or brush.

Coating Resin 970B is adaptable as a wire coating for electrical equipment.

For more details on any of these resins, write Ciba Company, Inc., 627 Greenwich St., New York 14.

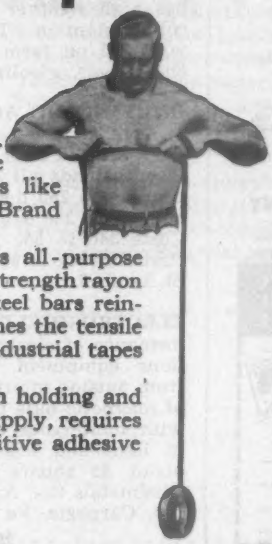
More on next page

New super-strong tape is strapping success!

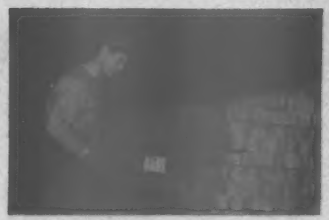
How would you package bulky school desks . . . bundle lumber for storage or shipment . . . reinforce cartons of heavy catalogs? Tough packaging jobs like these are easy with new, super-strong "SCOTCH" Brand Filament Tape No. 880!

What's the secret to the super-strength of this all-purpose packaging tape? Over 5,000 rod-like strands of high-strength rayon fibers reinforce every inch of tape width—just as steel bars reinforce concrete. That's why this tape gives you 5 times the tensile strength, 50 times the tear-resistance of most other industrial tapes now on the market!

"SCOTCH" Brand Filament Tape is solving tough holding and packaging problems in every industry. It's easy to apply, requires no expensive equipment, and its tough pressure-sensitive adhesive needs no moistening. Write Dept. FM11 for details.



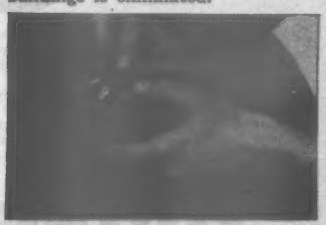
General Export: DUREX ABRASIVES CORP., *New Rochelle, N. Y.*
In Canada: CANADIAN DUREX ABRASIVES LTD., *Brantford, Ontario*



BANDING LUMBER with "SCOTCH" Brand Filament Tape virtually eliminates damage claims. Previous bundling methods caused average claims of 2% on a $1,500.00 truck load of bowling alley lumber.

REINFORCING CARTONS of heavy catalogs is safer, quicker with "SCOTCH" Brand Filament Tape. It's easy to apply and remove. And tape doesn't cut into cartons or contents or injure help.

PACKAGING TELESCOPE-TYPE CARTONS is now accomplished 30% faster with the aid of "SCOTCH" Brand Filament Tape. The disposal problem formerly caused by other bandings is eliminated.



HANDY DISPENSER offers quick, easy method of dispensing tough, tear-resistant "SCOTCH" Brand Filament Tapes. Trigger-operated cutting edge retracts when not in use.

Made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn., also makers of other "Scotch" Brand Pressure-Sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Abrasives, "3M" Adhesives.

What's Your HEATING PROBLEM?

COLD SPOTS?

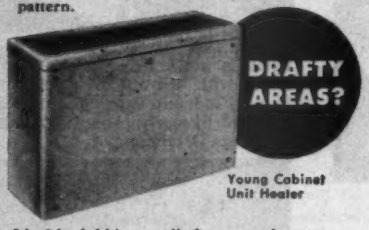
Young "SH" Unit Heater

Here's a favorite for warming up "cold spots" near windows, shipping room doors, etc., and for general space heating applications. These non-ferrous-core units deliver maximum heat transfer, use quiet and efficient fans.

EXTRA HIGH CEILINGS?

Young "Vertiflow" Unit Heater

Patented "Vertiflow" design offers a rugged, compact, highly efficient unit. Exclusive motor "ventilation" feature eliminates burn-outs from core heat. Diffusers, nozzles and Anemostats provide proper heat pattern.



DRAFTY AREAS?

Young Cabinet Unit Heater

Ideal for lobbies, vestibules, etc., wherever concentrated heating capacities are required and a compact, attractive cabinet-type design is necessary. For offices, specify Young Convector-Radiators for quick, clean, draftless heating.

YOUNG

Heat Transfer Products for Automotive and Industrial Applications.

Heating, Cooling, and Air Conditioning Products for Home and Industry.

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YOUNG RADIATOR COMPANY
Dept. 801-A RACINE, WISCONSIN
Plants at Racine, Wisconsin and Mattoon, Illinois
Sales and Engr. Representatives in Principal Cities.

THIS COUPON BRINGS FULL DETAILS ON THREE SOLUTIONS TO HEATING DIFFICULTIES

YOUNG RADIATOR CO.
Dept. 801-A, RACINE, WIS.
Rush me information on the following Young Unit Heaters:
☐ "SH" ☐ "Vertiflow" ☐ Cabinet

Name_____
Company_____
Address_____
City_____ Zone____ State_____

NEW MATERIALS

Begins on page 252

FOR MEN ONLY who are interested in easier molding of silicone rubber parts, there's a new compound designated as 81223. Says its maker, "It has excellent molding and extrusion properties after only a 5-minute warm-up." Get the whole story on applications, properties, etc., from General Electric's Chemical Dept., Pittsfield, Mass.

GOOD HIDING POWER is a feature of two Chlorclad synthetic rubber protective coatings. You use M-4 on metal and concrete, M-6 on wood. Both adhere to surfaces without use of primer or extensive surface preparation. Ask for Data Sheet C-21. Carboline Co., 7603 Forsyth Blvd., St. Louis 5.

LOOKS LIKE CORK, leather, marble, or granite, but it's paint; a one-coat paint that gives the appearance of these and other materials. The maker calls it Plextone. He puts it out in a wide variety of solid colors. All you do is pick out the proper combination, mix them together in a single container. Maas & Waldstein Co., 438 Riverside Ave., Newark 4.

TWO NEW RESINS are being manufactured by General Electric's Chemical Dept., Pittsfield, Mass. G-E Glyptal resin 2522 dries fast, has excellent adhesion. Maker says paint formulations using it are good for heat-resistant stove finishes, room interiors, venetian blinds. Tough-baking G-E Glyptal resin 731 has high weather resistance, high color retention. Try paints made with 731 on farm machinery, machine tools, gasoline pumps, etc.

ONLY NITRIC ACID affects Karbo-Kote, a new protective coating for wood and steel tanks and floors. It withstands all other acids, and heat up to 250 degrees F. on steel or rubber, 350 degrees F. on wood. Costs 34c to 56c per square foot. Carboline Co., 7603 Forsyth Blvd., St. Louis 5.

ELECTROSHIELD improves performance of electronic communications equipment by shielding it from outside interference. Consists of magnetic base clad on each side with nonferrous conductor. Made in light and heavy sheets up to about 35 square feet. American Cladmetals Co., Arch St., P.O. Box 544, Carnegie, Pa.

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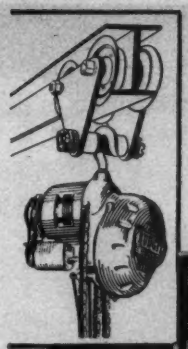
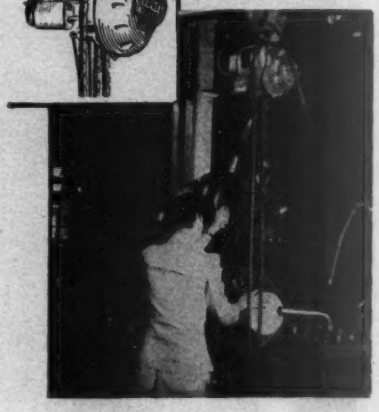


When strong men leave



When strong young men leave their jobs on production and assembly lines to serve their country, women and older men must fill the breach to keep our armies supplied with jeeps, tanks, shells, and all the implements necessary to maintain world-wide peace.

This means lifting — heavy lifting and that's where 'Budgit' Portable Electric Hoists come in. With them, women and older men quickly and easily handle the toughest lifting jobs with no danger of strain or rupture, no excess fatigue. 'Budgit' Hoists conserve the worker's strength, permit him to turn his energy into increased production.

Now, while more and more of your young men are going into the service, is a good time to check your plant for spots where 'Budgit' Electric Hoists and older men or women can take their places.

Available in all standard electric currents in a wide variety of speeds. Capacities: 250, 500, 1,000, 2,000, and 4,000 lbs. Prices start at $119. Write for Bulletin No. 391.

MAXWELL MANNING M&M MOORE TRADE MARK

'BUDGIT' *Hoists*

MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of 'Shaw-Box' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' Industrial and 'Microsen' Electrical Instruments.

Under Glass... THEY'D LAST FOREVER!

If you could pack your electrical apparatus in glass, there's no telling how long it would last!

But it's service use that pays off in profits, so a prominent locomotive maker chose the next best use for the protective qualities of glass—or, more specifically, insulating materials made with Fiberglas* yarns.

Here's how he does it:

Electric traction motors that directly drive the wheels on diesel-electric engines, normally have a usable life of only 600,000 road miles. Armatures and coils insulated with organic materials break down under service use, causing costly down-time.

The solution: Coil and armature insulation made with Fiberglas glass-base materials and silicones which permit higher currents, resist heat far longer. The result: traction motor ratings increased from 700 to 835 amperes . . . braking effort upped 23% . . . locomotive rating upped 25% . . . and, most important of all, *road-mile life increased 8 times!*

This is just one example of product improvement made with Fiberglas glass-base insulations. If you make or use electrical apparatus, it will pay you to specify Fiberglas insulating materials.

OWENS-CORNING FIBERGLAS CORPORATION, ELECTRICAL SALES DIVISION, 16 East 56th Street, New York 22, N. Y.

OWENS-CORNING FIBERGLAS

FIBERGLAS IS IN YOUR LIFE... FOR GOOD!

*Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

ARISTOCRAT OF WORK BENCHES

...built for men accustomed to the finest tools and equipment

We "pulled out all the stops" when we designed the HALLOWELL Cabinet Bench, giving it more "custom" features than any other stock bench we know of. All-steel construction, choice of top materials, ample storage space, standardized units, interchangeable accessories, and trim good looks are just a few of its advantages.

Steel shortages are causing deliveries, but we think you'll find them worth waiting for...

Bulletin 702 tells the story. Write for your copy today!

HALLOWELL

SHOP EQUIPMENT OF STEEL

Work Benches
Foreman's Desks
Tool Stands
Platform Trucks
Posture Stools
Posture Chairs
Cabinets
Folding Tables

SPS STANDARD PRESSED STEEL CO.
JENKINTOWN 11, PENNSYLVANIA

NEW MATERIALS

Begins on page 252

DOUBLE-DUTY COATING is both an active rust-inhibitor and a weather-resistant finish coat. Called Innox-Aluminum, it's used as primer or finish coat over other paints. The aluminum-color coating dries in about four hours. 5-gal. pails, $14.25. Single gallons, $2.95. Richmond Compositions Co., 708 Van Duzer St., Staten Island 4, N. Y.

TIME-SAVING finish aggregate for plaster combines vermiculite and gypsum, thus eliminates tedious hand-mixing operation. Maker has just completed three years of field tests on the new material. For details, write Zonolite Co., 135 S. LaSalle St., Chicago.

T STANDS FOR TOUGH in Carilloy T-steels. Developed by Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh 30. The first of the series, T1, is a multiple-alloy plate steel that combines high strength with ductility and toughness, even at subzero temperatures.

KNOW YOUR ABC'S? There's a new one out—ABC impregnating varnish. It's an oil-resistant insulating varnish for electrical units. Field tests show it won't crack even when exposed to temperatures of 150 degrees, then —70 degrees, and back to 150 degrees F. Varnish comes in 8-oz. units, has pot life of 24 hours. F. S. Bacon Labs., 172 Pleasant St., Watertown, Mass.

BAKING-TYPE coating intermediate is expected to form a versatile base for an entire field of protective coatings, according to General Electric's Chemical Department, Pittsfield, Mass. Labeled R-108, the coating intermediate combines high chemical resistance with flexibility and heat resistance. Coatings made with R-108 can be pigmented in wide variety of colors. Available in drum and tank-car lots.

PAINLESS REMOVAL of adhesive tape is easy with a liquid that releases surface tension between skin and tape. Comes in 2- and 4-oz. squeeze bottles. Patron Chemical Corp., 8506 Sunset Blvd., Los Angeles 46.

"Proper maintenance can increase conveyor belt life more than 50%. We keep our Republic Record Maker Belt centered to avoid unnecessary edge rub."
"Republic Record Maker may be the right conveyor belt for your job, too. Give us a call and we'll soon find out. Republic Distributors like me make free analyses of every job. Our recommendations save you money."
"Our lumber company greatly reduced labor costs with Republic Record Maker Conveyor Belting. At one spot alone, where rough oak planks are unloaded from boxcars, work efficiency has increased four times. The belt, in operation for more than 4 years, has long since paid for itself."
Try Republic First...
REPUBLIC CONVEYOR BELTS SAVE LABOR
Republic Conveyor Belts eliminate hours of tough, unnecessary labor on the job. Republic Products, like the lumber-hauling Record Maker Conveyor Belt shown below, are made of quality materials especially chosen to give extra performance at minimum cost. Your Republic Distributor is an expert analyst who can quickly tell which of the hundreds of Republic Industrial Rubber Products is best suited to your line of work. Contact him today, or write us direct. Remember, for a half-century the Republic name has stood for performance through quality. For best results "Try Republic First!"
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Recognized for years as top performers, MILFORD All-Hard REZISTORS are even better today! Severe break-down tests, conducted under identical cutting conditions, show today's All-Hard REZISTORS have 30% more endurance, deliver 28% more straight cuts, and are 5% faster than previous REZISTORS. M-2 high speed steel, a new development in metallurgy, enables REZISTORS to withstand friction of high speed cutting — adds hours to the blade's life. Specify these longer-lived time-saving, money-saving MILFORD blades. Select Industrial Distributors can serve you from stock.

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Profile and Band Saw Blades — MILFORD — Rezistor & Duplex Hack Saw Blades

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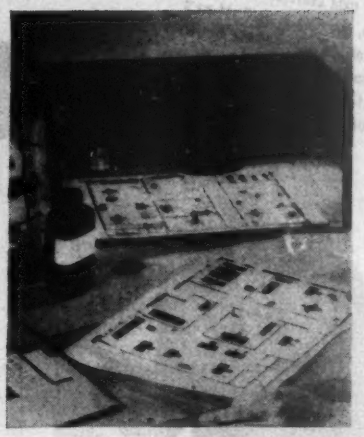
IDEAS OF THE MONTH

Begins on page 76



FLOOR PLANS OF YOUR NEW PLANTS can be made to scale fast with this "¼-inch equals 1 foot" kit made by the Gross Engineering Co., Inc., Three Rivers, Mich. A 12x18-ft. kit will cost you $95. The 24x36-ft. kit, $285. Layouts are traced on cross-hatched Vinylite sheets. First layout is outlined with pencil or scotch tape. Small Alnico magnets hold furniture and equipment cutouts on the board. Sensitized paper is then slipped between the sheet and the work and the work board, and is exposed to ultra-violet light. (Lamp is included in the kit.) Exposed paper is swabbed with developing fluid (right) and your floor plan is done. And no dark room is needed.

PAINT STICKS to metals and resists chemical attacks if it's made with Epon resins. They're made by Shell Chemical Corp., 50 West 50th St., New York 20. Flexible quality of the resin permits metal already coated to be shaped further without damage.

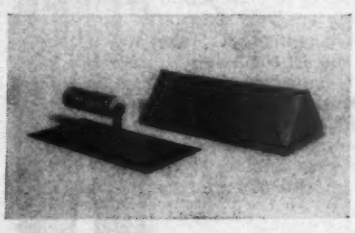
PRESHAPED STEELS will save you a lot of time by eliminating a lot of machinery operations. So A. Milne & Co., 745 Washington St., New York 14, is cold-drawing steel bar stock in special sections to fit specific uses. It can cut your machining operations to mere cutoffs.

MARK 1200 PIECES an hour! Sure, with Noble & Westbrook's model 50PI all-pneumatic machine. They also have hand and semi-automatic machines. Details from 19 Westbrook St., East Hartford, Conn.

CONCRETE, BRICK, plaster, and other masonry construction can be waterproofed with Lipton all-seal waterproofing. Works well on wood, too. You can cover 200 to 350 square feet of surface per gallon, by brush or spray. Cost: $5.25 per gallon. It's sold by Progressive Enterprizes, 1001 North Vermont St., Los Angeles 49.

METERING PUMP dispenses liquids from a bronze 1½-gal. tank in controllable amounts. For materials needing heat for liquid consistency a thermostatically controlled strip and cartridge give temperatures up to 4500 deg. F. Edw. E. Robinson, Inc., 95 Park Ave., Nutley 10, N. J.

MARKING CRAYON for use on metal, glass or wood can be wiped off with a damp cloth. Get Crayoff from Celco Corp., 1631 Tenth St., Santa Monica, Calif. A box of 12 crayons will cost you $1.44.



SHELLCREASE is a new corrugated material designed for packing irregular-shaped tools. Minute scoring marks in the corrugations permit it to be folded against the corrugation at any point. Shelton Mfg. Co., Inc., 42-24 Orchard St., Long Island City, N. Y., makes it.

More on next page

FIRST

IN QUALITY STEEL EQUIPMENT

for YOUR NORMAL NEEDS

LYON offers more than 1500 regularly cataloged items of steel equipment engineered to meet your civilian or defense production requirements. See list below.

for DEFENSE SUB-CONTRACTS

Complete sheet metal facilities to handle gauges 10 to 24. Two strategically located plants, 1500 trained workers, our own toolrooms, 3800 contracts in World War II.

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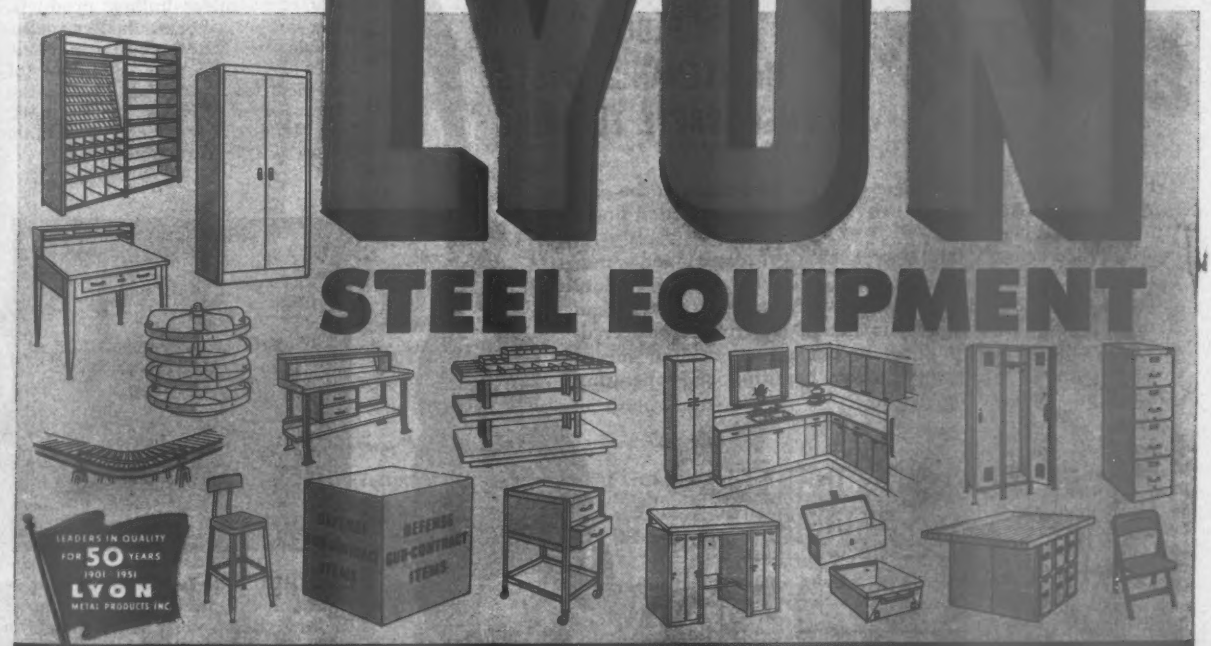
LYON STEEL EQUIPMENT



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• Lockers	• Cabinet Benches	• Bar Racks	• Flat Drawer Files	• Drawing Tables	• Folding Chairs	• Sorting Files	• Shop Boxes
• Stools	• Storage Cabinets	• Tool Boxes	• Toolroom Equipment	• Revolving Bins	• Work Benches	• Drawer Units	• Tool Trays
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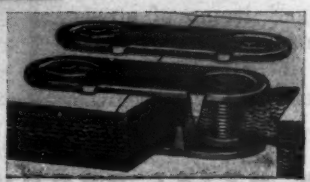
BELT FASTENERS and RIP PLATES

FOR HEAVY CONVEYOR AND ELEVATOR BELTS OF ANY WIDTH

- ★ FLEXCO Fasteners make tight butt joints of great strength and durability.
- ★ Trough naturally, operate smoothly through take-up pulleys.
- ★ Distribute pull or tension uniformly.
- ★ Made of Steel, "Monel," "Everdur." Also "Promal" top plates.
- ★ FLEXCO Rip Plates are for bridging soft spots and FLEXCO Fasteners for patching or joining clean straight rips.



Compression Grip distributes strain over whole plate area

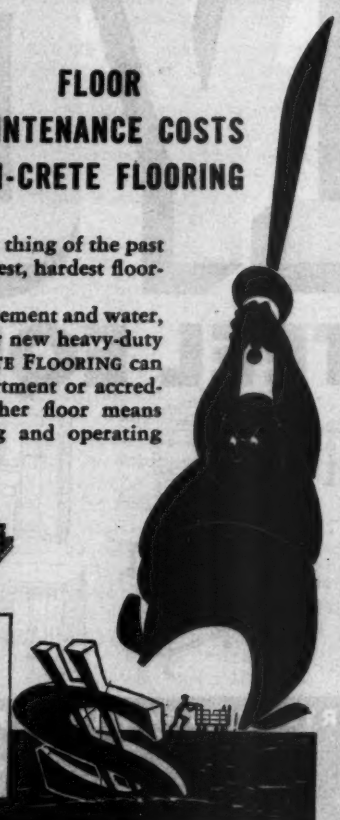
Order From Your Supply House. Ask for Bulletin F-100

FLEXIBLE STEEL LACING CO., 4678 Lexington St., Chicago 44, Ill.

Slash...! FLOOR MAINTENANCE COSTS with EMERI-CRETE FLOORING

Floor repair and replacement costs can be a thing of the past with EMERI-CRETE FLOORING . . . the toughest, hardest flooring material ever used!

Made of CORTLAND EMERY AGGREGATE, cement and water, it is hard, smooth and skid-proof. Ideal for new heavy-duty floors or resurfacing old ones—EMERI-CRETE FLOORING can readily be laid by your maintenance department or accredited local contractor. This harder smoother floor means easier-moving equipment, lower handling and operating costs, and reduced accidents.



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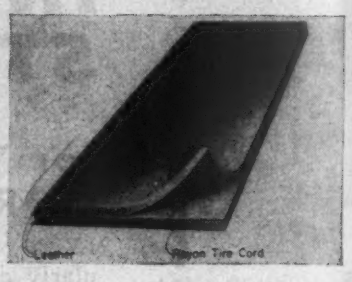
IDEAS OF THE MONTH

Begins on page 76



YOUR CONVEYOR BELT WON'T STRETCH if it's made by the Chas. A. Schieren Co. The company claims that the layer of rayon tire cord laid between the two layers of leather belting prevents stretch. They say it will go a year without take-up. Belts made by the Schieren process can be scarfed. Also made endless. Regular fasteners or lacing can be used. Write to 30 Ferry St., New York, for details and applications.

HOLOFLO process is said to save 10% to 50% of the manufacturing costs of seamless hollow products. Like rubber, thermoplastics, cellulose derivatives. A simple machine splits in half the thickness of sheets of any material, leaving the edges joined. Charles A. Randorf, Inc., 1807 Elmwood Ave., Buffalo 7, can tell you all about it.

ANOTHER SPRAY-DISPENSER — this time for brushing up the original factory finish on your machine tools. The one can is all you need. The 12-oz. can costs $1.85, a 6-oz. can, $1.35. Buy 'em from Sprayon Products, Inc., 2075 East 65th St., Cleveland 3.

The "MASTER"® Line

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The Most Complete Line Of Materials Handling Equipment On Wheels

Buy the type of machine engineered to fit your job!
Whatever you make; whatever you move, – whatever you lift, lower, store, or ship, we can supply the work-saving, space-saving, time-saving equipment to fill the bill at the lowest possible investment on your part. A "Master" Line survey will cover your materials handling requirements from receiving to shipping . . . multiply your manpower and save you factory space, time and money!

Phone your nearest L-S Sales and Service . . . or Write us for one or more of these new catalogs . . . today.

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(27) SpaceMaster Gas Fork Trucks – with multiple disc, metal to metal, wet plate clutch

(28) PowerMaster Stackers, Work-Height Lifters, Handy Hoisters, Portable Cranes

(29) FloorMaster Trucks, Standard and Special

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LEWIS-SHEPARD PRODUCTS INC., 214 WALKER ST., WATERTOWN 72, MASS.
Midwest Plant CRAWFORDSVILLE, INDIANA

MULTIPLY MANPOWER · LEWIS-SHEPARD

The "MASTER" Line

This Lubricant saved us $2,098.16"

"During the seven month period before using LUBRIPLATE No. 130AA in the bearings of our Kraft Mill Lime Kiln, we used a conventional oil of the density recommended. The cost of the lubricant for the period was $2,134.00. In the seven months that followed, we only used 128 lbs. of LUBRIPLATE No. 130AA for initial filling and replacement at the cost of $35.84. LUBRIPLATE No. 130AA only requires weekly applications whereas the former lubricant required daily application."

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LUBRIPLATE Lubricants are available from the lightest fluids to the heaviest density greases. They reduce friction, wear and power consumption, they prevent rust and corrosion, they last much longer than ordinary lubricants. There is a LUBRIPLATE Lubricant that is best for every lubrication requirement. Let us send you information about the use of LUBRIPLATE Lubricants in your industry. *Write today.*

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BOOKS...

For copies of books and booklets reviewed, write directly to publisher listed.

For Time Study and Methods Engineers

How to Chart Time Study Data

PHIL CARROLL, professional engineer. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18. Tables, charts, formulas, drawings, index. 323 pp. $5.

This is a book to help you get more out of your time study dollar. The author's charts show how to set up time study data in more efficient form. He outlines the reasons behind the charts, tells how to construct them and put them to good use.

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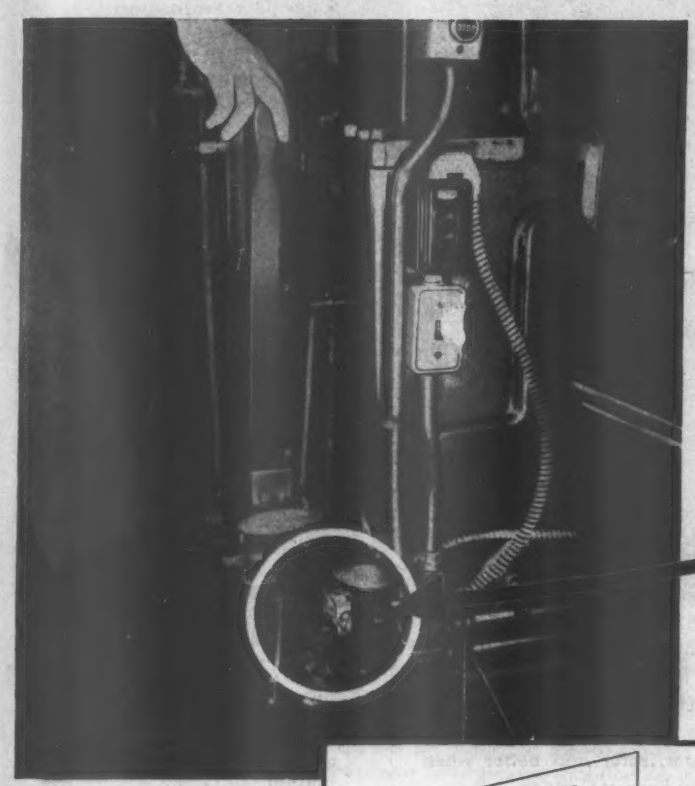
Read what 923 business organizations say about their own employee-benefit plans. The survey covers a wide cross-section of industry. It presents the executive viewpoint on type and size of benefit, coverage and eligibility, costs and financing, effect on employee morale, and the attitudes of organized labor.

•

CORRECTION: In the December, 1950, issue (page 262) FACTORY listed a price of $10 for the *1951 ASME Mechanical Catalog and Directory*. We were mistaken. There is no charge for the book. And it goes only to ASME members.

More on next page

Use MICRO Precision Switches to Solve Production Problems!

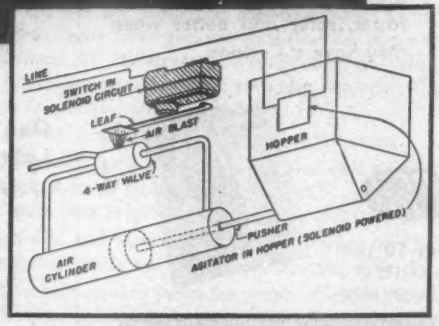


This switch prevents shearing of clutch pins on high-speed dieing machine

Installed under the clutch foot pedal of this high-speed dieing machine, this MICRO precision switch automatically causes the drive to return to slow speed when the clutch lever stops the ram motion. Connected in parallel with the "slow" button of the variable speed control it eliminates chance of starting the ram with drive at high speed, shearing the clutch pin.

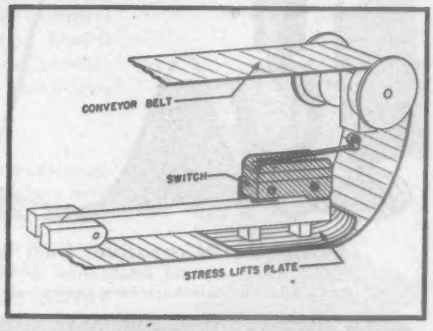
SEND FOR "MICRO TIPS"

Send for "MICRO TIPS" for more practical, time-saving ideas discovered by plant production men who have found MICRO precision switches the way to production short cuts. MICRO SWITCH distributors with complete stocks are located in over 100 cities to serve you. Look in your classified phone book.



Air blast operates switch to feed drill blanks from hopper

A short blast of exhaust air from the four-way valve strikes hinged metal vane to operate the MICRO precision switch. Switch operates solenoid on hopper which provides the necessary mechanical agitation to feed the drill blanks. Solenoid has spring-gravity return.



Find MICRO precision switch great trouble saver on conveyor belt

If this conveyor belt becomes stuck or overloaded, the increased stress lifts switch to contact and the conveyor is stopped automatically.

MICRO . . . first name in precision switches

MICRO Precision Switches

MICRO SWITCH

FREEPORT, ILLINOIS, U.S.A.

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

Copr. 1951 Minneapolis-Honeywell Regulator Co.

CM

LIGHT WEIGHT—HEAVY DUTY

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Picture this: a high speed chain hoist that weighs only 35 lbs. for the 1 ton capacity model. No more struggling with slow, ponderous, outmoded hoists. The Cyclone can be carried around with ease. Lifts loads rapidly with an easier pull on the chain. Can take the rough handling of maintenance crews or the continuous duty of production application. Workmen are grateful... do their work faster, safer and better when they have a Cyclone.

AVAILABLE IN capacities from ¼ to 10 ton.
For all the construction details write for Bulletin 145 C or phone your local distributor for a demonstration in your plant.

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Affiliated with Columbus McKinnon Chain Corporation

GENERAL OFFICES AND FACTORIES: TONAWANDA, N. Y.

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BOOKS...

Begins on page 262

For Personnel Executives and Other Company Policymakers

Wage Determination Under Trade Unions

JOHN T. DUNLOP, Harvard University. Augustus M. Kelly, Inc., 31 E. 10th St., New York 3. Tables, charts, formulas, references, index. 230 pp. $3.

Originally published in 1944, this was one of the most sought-after works in the field of labor economics. Now it's back in print, with a new preface by the author. It's as timely as ever.

Valuable Reference Manual for Every Industry

How You Can Sell to the Government

HARRY A. ROCHESTER, Captain, U.S. Navy, Retired. B. C. Forbes & Sons Publ. Co., Inc., 80 5th Ave., New York 11. Charts, tables, sample forms, appendixes, index. 366 pp. $7.50.

First-hand knowledge of both business and governmental dealings, plus technical advice from lots of experts in both fields, have enabled the author to put together a clear, comprehensive guide for businessmen, large and small. Covers methods, standard contract data, sources of information.

One Way to Reduce Winter Lateness and Absenteeism

Snow Melting

T. NAPIER ADLAM, consulting engineer. Industrial Press, 148 Lafayette St., New York 13. Charts, photos, diagrams, drawings, tables, formulas, index. 224 pp. $4.50.

It may cost less than you think to keep your sidewalks, entrance-ways, and ramps free of snow with radiant heating. Here, an expert tells just how to go about figuring your own requirements, how and where to install hot water coils, and how to control the heating system. He devotes one chapter to installation and operation costs, proves that they're not beyond the average plant's budget.

Where GREASE RESISTANT FLOORS are important

SPECIAL KENTILE for industry is the answer!

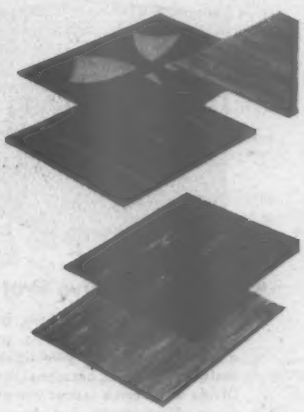
HERE IS THE IDEAL asphalt tile for industrial use—Special KENTILE for Industry! It's grease resistant. Petroleum oils, greases, gasoline do not affect it. Also it resists vegetable and animal oils and greases. Won't soften or stain under alcohol, alkalis, or most acid solutions! Furthermore—it's *slip-resistant*. Cuts down time and compensation loss from falls and accidents.

It's *tough*. Won't scar or scuff. Ideal for heavy traffic areas.

It's *colorful*—a flooring with lasting beauty. The color-fast, non-fading colors go clear through to the back. Lots of colors to choose from...colors that take a high polish—and keep it. Colors that brighten your plant...improve employee morale.

It's *low-priced*...and you can install it anywhere...over concrete, over wood or metal floors—even below grade on concrete in contact with the earth.

For all the information you need to judge for yourself what this special KENTILE for Industry can do for *your* plant—write any of the offices listed below!



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SPECIAL KENTILE®

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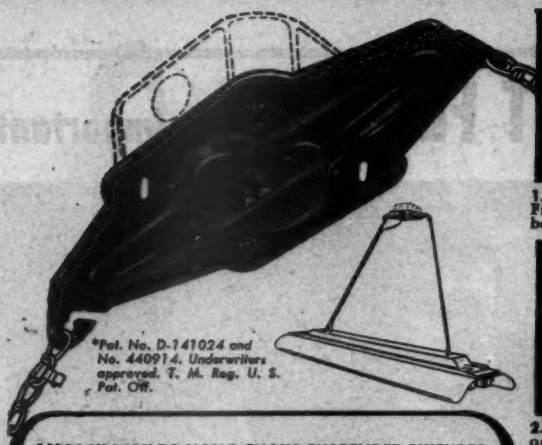


*Pat. No. D-141024 and No. 440914. Underwriters approved. T. M. Reg. U. S. Pat. Off.

AN EASY WAY TO HANG CHAIN-SUSPENDED FIXTURES IN LESS TIME... AT LESS COST... WITH LESS WORK WITH

HYDEE HANGER*

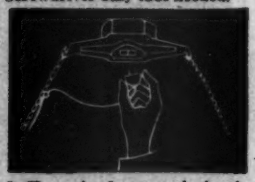
DECIDEDLY BETTER DAY-BRITE Lighting Fixtures 01

Day-Brite Lighting, Inc., 5441 Bulwer Ave., St. Louis 7, Mo.
In Canada: Amalgamated Elec. Corp., Ltd., Toronto 6, Ontario

DISTRIBUTED NATIONALLY BY LEADING ELECTRICAL WHOLESALERS

1. Connect wires to receptacle. Fits standard 4" or 3¼" outlet box or plaster ring.

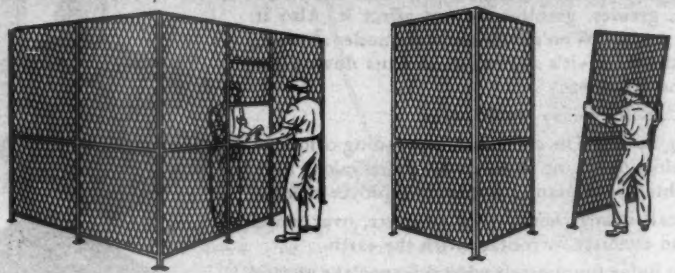
2. Screw hanger to outlet box—only two screws needed. No centering, punching, or drilling. Screwdriver only tool needed.



3. Hang the fixture and plug it in. That's all! Self-grounding—regular 2-wire cord and plug may be used.

Hydee Hanger: complete with receptacle, two 5-ft. chains, "S" hooks and clips—

Protect TOOLS AND EQUIPMENT WITH ACORN WIRE MESH PARTITIONS



● Provide Positive Protection

Acorn Wire Mesh Partitions, by enclosing tool cribs and stock rooms, prevent tool and parts pilfering, give tight control of tools, material and personnel in these areas. Divide large open spaces into efficient, separate departments, cut down confusion. Cost much less than solid walls, permit passage of light, air, sound and heat.

● Simple, Quick to Erect

Made in inexpensive standard panels in two designs, Acorn Wire Mesh Partitions are easy to erect, take down, or move anywhere, with no need to move radiators or lights. Can be added to, or reduced in size. Doors can be moved, and corners made quickly to meet changing needs.

ACORN WIRE AND IRON WORKS

5922 SO. LOWE AVE., CHICAGO 12, ILL.

SEND TODAY for fully illustrated catalog. See why Acorn partitions are standard equipment in over sixteen thousand plants.

BOOKLETS

Begins on page 262

SOURCES OF ECONOMIC INFORMATION FOR COLLECTIVE BARGAINING. Ernest Dale. Research Report No. 17. American Management Assn., 330 W. 42nd St., New York 18. A guide to the maze of data bearing on wage negotiation and determination. Tables, sample forms, references. 171 pp. Available to nonmembers May 1, $3.75.

THE ABC'S OF SALT AND SODA FOR SHOCK IN BURNS. Federal Security Agency, Public Health Service, Washington 25, D.C. The life of a badly-burned worker may be saved if his buddy has read this simple leaflet. Tells how to stop shock before doctor arrives. 4 pp. Single copies free.

MILITARY LEAVE POLICIES IN 500 COMPANIES. Bureau of National Affairs, Inc., 1231 24th St., N. W., Washington 7, D.C. Discusses bonuses, pay differences, insurance premiums, dependents, accrued vacations, and the like. 28 pp. $1.

PRIOR LEARNING AS A FACTOR IN SHAPING PERFORMANCE CURVES. A. H. Shephard and Don Lewis, Iowa State Univ. Office of Technical Services, U.S. Dept. of Commerce, Washington 25, D.C. Covers performance and ability tests. Photo, diagram, charts. 9 pp. Microfilm or photostat, $1.25. Ask for PB 101487.

WAGE SUPPLEMENTS. The Nonwage Labor Costs of Doing Business. Economic Research Dept., U.S. Chamber of Commerce, Washington 6, D.C. A study of practices in 690 companies. Charts, tables, copy of questionnaire used in survey. 16 pp. Single copies, 50c.

Available From Superintendent of Documents Government Printing Office, Washington, D. C.

SURVIVAL UNDER ATOMIC ATTACK. National Security Resources Board. Here's Uncle Sam's official word on what atom bombs can *and can't* do and how the individual can protect himself from their effect. Indexed for quick reference. 32 pp. Single copies, 10c. Orders over 100, 25% discount.

WOMEN IN HIGHER-LEVEL POSITIONS. A survey of how women fit into the management class and how they affect achievement. Illustrated. 86 pp. 25c.

High-production set up to drill 19 holes in 5 sides of pump housing at the Heil Co, Milwaukee. 8 17" Drill Press heads (5 standard 2-spindle heads, and 2 with special 3- and 5-spindle heads) mounted on a special table with suitable controls make up this low-cost machine.
DELTA
MILWAUKEE
Delta drills from every Direction!
Build your own special equipment at low cost around Delta accuracy and flexibility!
When you think of drilling think of Delta! Your own imagination plus the amazing adaptability of standard Delta drill presses or components can crack the toughest problem. Look what the Heil Co. did (above) with 8 Delta heads! One operator drills 19 holes in a casting—in a floor to floor time of 2.8 minutes! And at a fraction of the cost of a special-purpose machine, or a multi-station operation!
Do the same in your shop! The sealed, lubricated-for-life ball bearings in Delta drill heads let you drill from all directions — vertical, sideways, upside down, at all angles — without lubrication problems.
Send for complete details—and plan your jobs around the versatility of dependable Delta Tools — high in quality, low in cost! Delta's engineering service is always ready to help you.
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● You can cool air, gas, water, oils, chemicals, electric and power and process equipment, engines, mechanical processes with lower cost and really accurate control of temperature with the Niagara Aero Heat Exchanger.

You are assured of uniform, constant production and quality from any process . . . steady, reliable operation . . . lower cost for more dependable cooling. You can have closed system cooling with freedom from scale, dirt, corrosion and maintenance troubles. You can accurately cool more than one type of liquid with one machine.

The Niagara Aero Heat Exchanger uses atmospheric air to cool liquids and gases by evaporative cooling. You can remove heat at the rate of input to keep accurate control of gas or liquid temperature. You can put heat back into the system to save the losses of a "warm-up" period or to equalize the effect of load variations.

Great savings in cooling water and savings in piping, pumping and power return the cost to you quickly. The Niagara Aero Heat Exchanger can save you approximately 95% of your cooling water cost. Write for Bulletin 96.

NIAGARA BLOWER COMPANY

Over 35 Years Service in Industrial Air Engineering

Dept. F, 405 Lexington Ave. New York 17, N. Y.

Experienced District Engineers in all Principal Cities

INDUSTRIAL FILMS

. . . Do you have a film or films that might help management do a better job? Help employees learn their job faster, better? If so, tell us about it and we'll pass the information on to those who can use what you have.

Quality Mill is a new film which takes the audience on a tour of a modern copper-alloy mill. Actual production scenes, routing and scheduling procedures used, and the test for quality are pictured. New 4-high mills are shown in action. 16mm. You can get it from:

Mr. A. G. Dennison, Asst. Gen. Sales Mgr., The Riverside Metal Co., Riverside, N. J.

A Romance of Industry tells the story of modern abrasives and abrasive products, and their uses. The film follows the development of abrasives from early experiments to present day mass production. 16mm., runs 18 min. Write to:

Association Films, 35 W. 45 St., New York 19.

Help Yourself to Beat the Heat is designed as a training guide in combatting heat sickness, common in hot metal operations of steel mills and foundries. If you've got a 'hot spot' problem, the ideas and techniques presented may help you. 16mm., in color, runs 12 min. It's available from:

U. S. Steel Corp. of Delaware, 71 Broadway, New York 6.

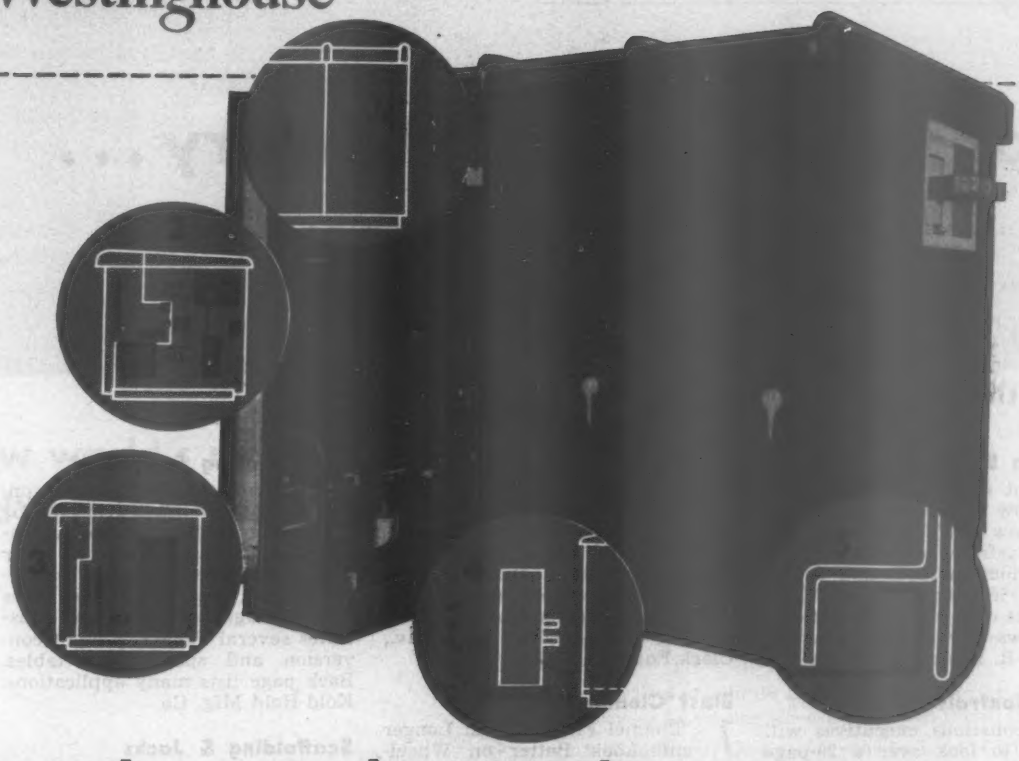
Strength in the West gives a complete explanation of the various facilities and processes involved in iron and steel production; including blast furnace, open hearth, and rolling mill operations. 16mm., in color, and running 22 min., the film can be obtained by writing to:

Public Relations Department, Kaiser Steel Corp., 1924 Broadway, Oakland 12, Calif.

Electronics at Work is a clear presentation of the theory, design, and use of electronic tubes. Shows how the tubes are used to amplify, generate, control, and transform energy. Runs 20 min., 16 mm. Available from:

Modern Talking Picture Service, 45 Rockefeller Plaza, New York 20.

YOU CAN BE SURE.. IF IT'S
Westinghouse



Westinghouse Outdoor Switchgear gives you
5 NEW OPERATING ADVANTAGES

Westinghouse brings you redesigned 5-Kv Outdoor Metal-Clad Switchgear with improvements that add up to time and cost savings in installation, operation and maintenance.

Greater accessibility of operating parts . . . better ventilation and weatherproofing . . . improved appearance are among its advantages that give you more for your switchgear dollar.

1. Control knife switches are in easy-to-reach position.
2. Auxiliary compartments provide better equipment access. More headroom makes inspection and maintenance easier.
3. Enclosure makes possible use of two potheads for two 3-conductor cables without sacrificing the full-length instrument panel. Adequate clearance is afforded behind the panel at the pothead elevation for semi-flush Flexitest cases and average-depth Type W switches.
4. Platform height is adjustable. Transport truck provides adjustability for slight variations in pad level.
5. Newly designed doors with flanged edges provide extra rigidity and improved weather seal.

Get complete facts from your nearby Westinghouse representative, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

★ ★ ★

See "Electrical Proving Ground" . . . the dramatic story of the Westinghouse High Power Laboratory in sound and color motion picture. For details, write Westinghouse Film Division, Box 868, Pittsburgh 30, Pennsylvania. J-60743

IMPORTANT NEW CATALOGS

For Your Working Library . . .

. . . a carefully selected list of manufacturers' bulletins and catalogs to help you keep up to date on new cost-cutting equipment. Tell us which ones you want. Circle the numbers on the coupon on page 276.

Filtration Equipment

1 Almost every company wants to know "How can we get clean water at low cost?" A new 20-page catalog illustrates and compares in detail various methods and equipment for industrial water filtration. Three-color diagrams and cutaway views show how equipment operates. R. P. Adams Co., Inc.

Motor Controls

2 Cost-conscious executives will want to look over a 20-page booklet that tells about the Life-Linestarter for motor control. Standardized parts simplify installation and maintenance. Simplified design assures reliable performance. Close-ups, charts, parts photos tell the story. Westinghouse Electric Corp.

Switchgear

3 Double-action arc interruption is one feature of the indoor and outdoor switchgear described in an illustrated bulletin. Covers circuit breakers, switchboards, unit substations. Ratings and space requirement tables, parts and installation photos. 20 pages. Allis-Chalmers Mfg. Co.

Flat Belting

4 Belting for every type of power transmission job is described and illustrated in an 8-page catalog. Formulas, charts, and tables help you choose the right kind for any application. Thermoid Co.

Overhead Cranes & Hoists

5 More than 50 years of experience stands behind the overhead cranes and hoists pictured in a 4-page circular. Discusses construction details and various models available in each type. Lists numbers of specific bulletins on each type. Northern Engineering Works.

Powered Hand Trucks

6 High power reserves and extra-short turning radii are two advantages of the gas- and electric-powered hand trucks described in a 12-page bulletin. Drawings and diagrams emphasize special design details and dimensions. List of dealers. Industrial Truck Div., Clark Equipment Co.

Blast Cleaning System

7 "Enamel Finishes Last Longer and Look Better on Wheelabrated Surfaces" is the title of a new 4-page circular. Case studies show how the blast cleaning system improves appearance and adherence of enamel. Back page discusses operating principle and advantages. American Wheelabrator & Equipment Corp.

Pre-Assembled Fasteners

8 Keps, the pre-assembled nuts and lock washers, can take a big chunk out of your assembly costs. Two bulletins tell how they are designed and suggest applications. Both include type and size data. Shakeproof, Inc., Div. of Illinois Tool Works.

Synchronous Motors

9 There's an E.P. low-speed synchronous motor for practically every application. A 4-page folder shows how they're designed, also gives the facts about vertical-type synchronous motors. Photos illustrate important features. Electric Products Co.

Welding Electrodes

10 You can carry the new P & H 56-page electrode guide around in your pocket. Page tabs mark the different classifications. A 2-page chart compares corresponding types. Application data and sizes are included. Welding Div., Harnischfeger Corp.

Tank Heating Equipment

11 Platecoils—metal plates containing pre-formed grid-coils for circulating heating or cooling media—can cut way down on your installation, operation, and maintenance costs. A six-page folder gives 10 advantages, describes and illustrates several models, present conversion and specification tables. Back page lists many applications. Kold-Hold Mfg. Co.

Scaffolding & Jacks

12 For versatility and quick-erection time, there's Waco sectional scaffolding and scaffold jacks. You get the whole story in an 8-page circular packed with photos and drawings that point out the many uses and advantages of this equipment. Back page tells about the Waco swing stake. Wilson-Albrecht Co., Inc.

Unit Heaters

13 A compact unit heater weighing only 57 pounds delivers plenty of heat for small areas like power plants and other small buildings. It can be used with either steam or hot water. An illustrated circular gives the details. Young Radiator Co.

Tool- & Pressroom Equipment

14 Friction-type roll feeds, stock oilers, reels, cradles, and stock straighteners are the subject of three circulars. Photos, specifications, and construction features are included. Durant Tool Supply Co., Div. of Durant Mfg. Co.

Single Drum Hoists

15 A 16-page bulletin gives the facts about single-drum, multi-purpose hoists from 500- to 3500-lb. capacity. There are electric and gas engine types. A handy selection chart is included. Joy Mfg.

More on next page

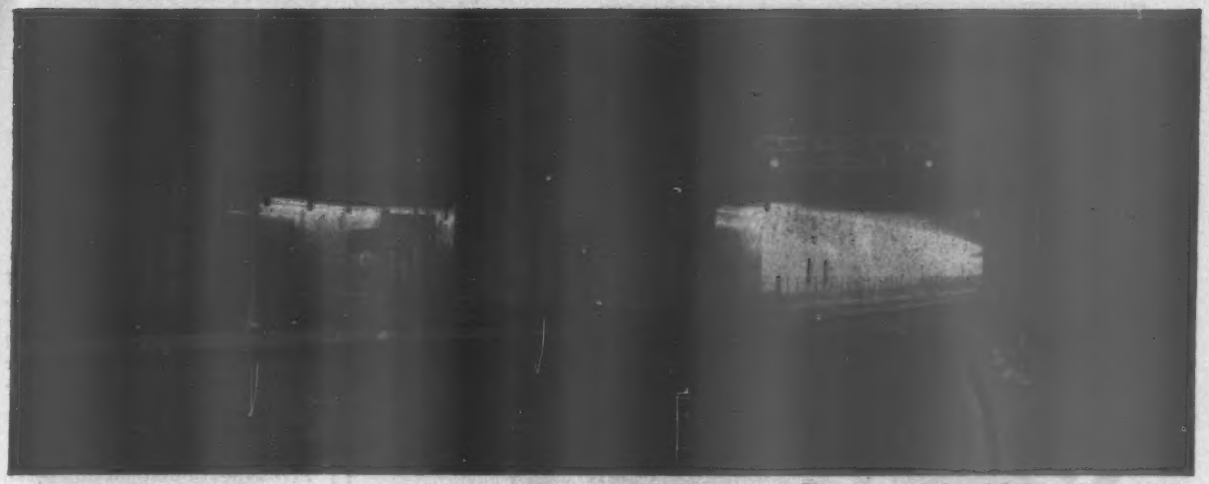


Photo courtesy of Triborough Bridge and Tunnel Authority

How world's most modern light takes the "lid" off the world's most modern tunnel

THERE'S none of that "closed-in feeling" in the spectacular, new Brooklyn Battery Tunnel between Manhattan and Brooklyn. Not only walls and roadway, but ceiling, too, is well-lighted with General Electric *slimline* fluorescent lamps—the world's most modern source of light.

Slimline's long lines of light do away with the annoying bright flashing effect caused by passing the usual recessed tunnel lamps.

Why not find out about slimline for your business? Call your G-E lamp supplier. And for a free booklet, "Modernize with G-E Slimline," write General Electric, Div. 166-FM-1, Cleveland 12, O.

6 points to remember about G-E slimline:

1. NEW STREAMLINED APPEARANCE

2. INSTANT START . . . NO STARTERS

3. SINGLE PIN BASE . . . EASY TO INSTALL

4. HIGH EFFICIENCY

5. LOWER UPKEEP . . . FEWER LAMPS TO REPLACE

6. LONG, DEPENDABLE LIFE

You can put your confidence in—

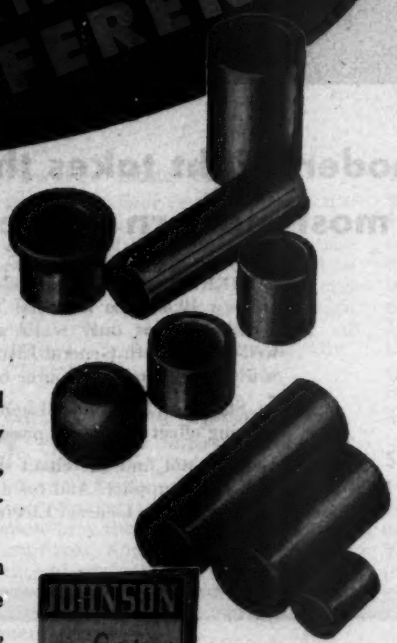
GENERAL ELECTRIC

JOHNSON BRONZE

Ledaloyl

SELF LUBRICATING BEARINGS ARE DIFFERENT!

Made from Pre-Alloyed Bearing Bronze Powder



Ledaloyl actually means "lead alloy"... a powder metallurgy product that combines copper, tin and lead in the form of a pre-alloyed bearing bronze.

The introduction of lead as an integral part of the bronze powder provides conformability, aids lubrication, and prevents freezing to the shaft. Myriads of tiny, evenly spaced pores serve as miniature oil wells, metering oil to the shaft when in use, absorbing it when at rest. Therefore, you have adequate lubrication at all times.

Write for **FREE** *Catalog on Stock Sizes of* LEDALOYL

Johnson Ledaloyl Bearings are die-molded to size, eliminating costly machining, and consequently, are very low in cost. This is an added cost-saving advantage in odd-shaped, flanged, and self-aligning designs, and in large quantities of a size. Johnson Bronze engineers are glad to assist you in determining whether you can use Ledaloyl Bearings to your advantage. Write today!

Johnson Bronze

SLEEVE BEARING HEADQUARTERS

SOUTH MILL STREET • NEW CASTLE, PA.

NEW CATALOGS FOR YOUR WORKING LIBRARY

Begins on page 270

Motor Generator Sets

16 From rolling mills to wind tunnels, there are hundreds of applications for synchronous motor-generator sets. An illustrated catalog describes all the special construction features, shows four typical installations. 8-pages. General Electric Co.

Disconnecting Switches

17 Five types of outdoor and seven types of indoor disconnecting switches are pictured and described in an 8-page booklet. There's a model for every use, in every system. Booklet includes references to more detailed literature. Westinghouse Electric Corp.

Fork Truck Accessories

18 Your fork truck drivers can transfer materials from one container to another with the revolving carriage attachment described in an illustrated circular. Another circular presents photos and design data covering overhead guards for fork trucks. Towmotor Corp.

Dry-Type Transformers

19 It's safer and less expensive to install and maintain dry-type transformers, says Westinghouse. A 23-page booklet tells why. It illustrates types of air-cooled transformers for every use —from operation of inter-office communications systems to 10,000 kva. power centers. Westinghouse Electric Corp.

Lubrication Systems

20 Want to know how standardized mass lubrication can save man-hours, machine-hours, materials, and power? Lincoln's 8-page booklet on centro-matic lubrication systems tells how mass lubrication is used in many industries, shows how the various systems work. Includes descriptions of parts and fittings. Lincoln Engineering Co.

Fork Truck

21 A hydraulically actuated clutch in the Transitier fork truck assures smooth starts and long life, says the maker. A folder discusses applications, operating costs. Includes case studies and photos. Transitier Truck Co.

More on next page

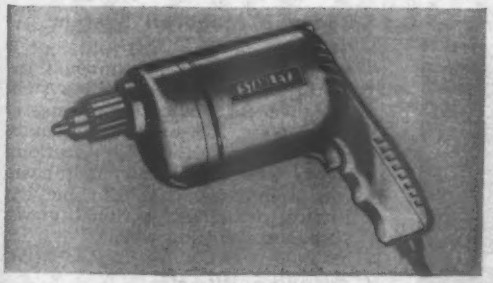
GET MAINTENANCE WORK DONE IN MINIMUM TIME

with the **STANLEY ELECTRIC HAMMER No. 310-A**

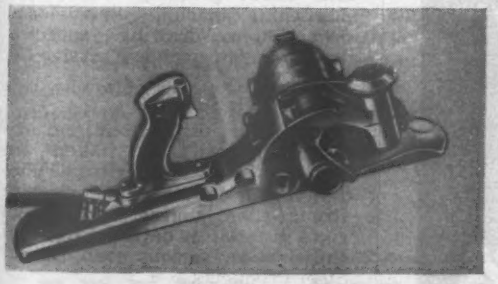
More blows per second! This important advantage of the Stanley 310-A Electric Hammer means speedier drilling and chipping of stone, concrete, brick; chiseling wood; scaling rust; vibrating forms; etc.

At the same time, operators find the 310-A less tiring. Ingenious design features the "free-thrown" plunger (exclusive with Stanley) . . . no direct connection between motor mechanism and plunger. It hammers without the need for pressure on the handle. *Result:* there's no kick-back, less vibration, and virtually no chance of breakdown.

The 310-A is completely self-contained. Does not require such auxiliary equipment as air pump, control box, or converter. Weight is only 13 lbs. Packs in handy steel carrying case. Operates on either A.C. or D.C. lighting circuits. Powerful motor and heavy-duty seal-type ball bearings assure long life. Capacity 1⅛" diameter hole. See the 310-A at your dealer's, or write for detailed literature. Stanley Electric Tools, 506 Myrtle Street, New Britain, Connecticut.



No. 166 Drill. A powerful, high-speed ¼" hand drill for drilling steel or wood. Sealed-type ball bearings. Universal motor. Weight 5 lbs. Length 8" along chuck line.



J-5 Power Plane. Largest, most powerful electric plane on the market. Planes all wood surfaces up to 2½" wide. Speed 18,000 r.p.m. 1 h.p. motor.

STANLEY

Reg. U.S. Pat. Off.

HARDWARE • TOOLS • ELECTRIC TOOLS • STEEL STRAPPING • STEEL

CASE No. 395
Refrigerator Manufacturer

ANNUAL SAVINGS OF $30,000 over former hand trucking method. Conveyorizing paid for itself in 6 months.

(a) Savings in Effort (estimated).....25% (c) Savings in Space.....30%
(b) Savings in Time.....25% (d) Savings in damaged material of some 60%

QUOTING CUSTOMER'S* STATEMENT:

"We have a problem of segregating 18 different boxes from an almost continuous line of material so that they can be shipped or stored according to models and methods of packing or shipping. To do this job, Logan roller conveyor turntables have been installed in the main "feeder" lines, which permits selection of material from the assembly tracks. This method has realized a savings for our company of some $30,000 over the method used formerly of hand trucking and segregation. A savings in floor space amounted to 30% and in time of 25%. Damaged material from improper handling has been almost eliminated, thus making a savings along that line of some 60%. Experience has shown us that the roller conveyors used on the turntables and banks have stood up admirably well under the extremely rough usage they are subjected to. Maintenance cost is at a minimum."

*Name on request.

Case after case . . . in plants large and small . . . proves that it pays to conveyorize. There may be many operations in *your* plant which can profit through the use of Logan Conveyors. Write for your copy of enlightening book, "Key to Lower Costs."

Logan Conveyors

LOGAN CO., 510 CABEL ST., LOUISVILLE, KY.

NEW CATALOGS FOR YOUR WORKING LIBRARY

Begins on page 270

Building Material

22 "Build and Insulate With One Material" is the title of a folder that tells how Marinite cuts fuel bills and resists corrosion. Text and photos emphasize use of the sheet material for breechings, building of ovens and driers, and for structural steel fireproofing. Tables and drawings describe properties. Johns-Manville.

Magnetic Separators

23 Bothered by tramp iron in your materials in process? Take a look at a new circular on three models of Atomagnet magnetic separators. Tells about five new design features that assure dependable operation. Includes photos, dimensions, specifications. Eriez Mfg. Co.

Unit Substation

24 Allis-Chalmers single circuit unit substation is arranged for maximum accessibility and easy maintenance. An 8-page catalog gives the details. Includes diagrams and photos. Allis-Chalmers Mfg. Co.

Crane & Monorail System

25 Whiting has just put out a new bulletin on Trambeam, the light crane and monorail system designed for low-cost handling of loads from 250 to 20,000 pounds. Bulletin describes applications, shows where and how Trambeam can fit into *your* handling picture. Photos, drawings, sectional views. 20 pages. Whiting Corp.

Grinding Wheels

26 For the latest data on grinding wheels. check two new Simonds catalogs. One describes toolroom grinding wheels, the other tells about grinding wheels for sharpening machine knives and saws. Photos, drawings, specifications, prices. Simonds Abrasive Co.

Guard Windows

27 Prowlers can't get in and materials can't be taken out through Fenestra Security Windows. They are steel windows with strong steel guards. A bulletin gives installation details, lists types and sizes for various uses. Detroit Steel Products Co.

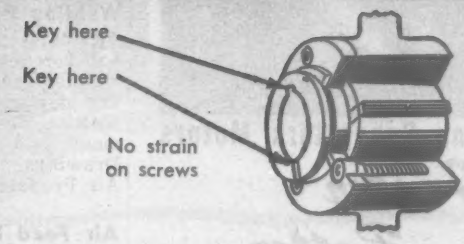
More on next page

ONE PIECE MOUNTING—Bushing and sheave go on together. Alignment is easy. Sheave is on right first time.

TEXROPE

This... Not This!

FULL CIRCLE GRIP — Bushing split full length. Collar is separate. Shaft gripped full length around full diameter.



POSITIVE DRIVE — Bushing is keyed to both shaft and sheave. No slipping. No sheared screws. No jammed bushings.

USE FAST-MOUNTING Magic-Grip SHEAVES

Full Grip...No Slip!

MAGIC-GRIP SHEAVE is the fastest mounting sheave you can buy. And you can demount it just as fast. It runs true, will not slip or jam. It always comes off easily without hammering, forcing, or distortion.

Best of all it costs no more than an ordinary sheave. Even if you don't change sheaves often, you should have *Magic-Grip* sheaves on every drive to eliminate the possibility of shaft and bearing damage when ordinary sheaves are hammered or pried on or off. Sizes 1 to 250 hp.

WIDEST V-BELT LINE

You can get everything you need for your V-belt drives from one reliable source. Allis-Chalmers offers the broadest line of V-belts, speed changers, and standard and variable speed sheaves in the industry. And you get the extra engineering skill that comes from having more industrial V-belts, installations than any other manufacturer.

Get the 120 page *Texrope* Pre-Engineered Drive Manual 6956 from your A-C Authorized Dealer or Sales Office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3240

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MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

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ALLIS-CHALMERS

PANGBORN AC-4

"CORN COB" Blast Machine

Cleans Generators, Motors

Faster Better Cheaper

Eliminates Toxic Hazard of Solvents!

THE new portable Pangborn AC-4 Blast Machine scours armatures, parts, frames, coils, etc. in ⅓ the time of other methods. Material costs are reduced 90% and toxic or explosive solvents are eliminated.

Look at the savings shown by this recent test on electric motors. (Name of Company on request.)

Cleaning Duplicate 500 hp Synchronous Motors		
	Material	Labor
Solvent Method	$55.00	120 hrs.
PANGBORN Method	5.00	40 hrs.
SAVING	50.00 (90.9%)	80 hrs. (66.7%)

Remarks: With Solvent, drying period took an additional 8 hours.

SIMPLE OPERATION

New Pangborn AC-4 Blast Machines use standard 40-pound air supply to remove oil and greases with blast of soft, 20-mesh corncob grits. No residue left on parts . . . no drying period.

FOR FULL INFORMATION, write today outlining your operation. Address: PANGBORN CORPORATION, 2100 Pangborn Blvd., Hagerstown, Maryland.

Look to Pangborn for the Latest Developments in Blast Cleaning and Dust Control Equipment

Pangborn

BLAST CLEANS CHEAPER with the right equipment for every job

NEW CATALOGS FOR YOUR WORKING LIBRARY

Begins on page 270

Universal Joints

28 Curtis has specialized in the design and production of universal joints since 1919. You'll be interested in their 1951 catalog. Tells the details from A to Z—test data, selection tips, engineering details. A 3-page list of applications is attached. Curtis Universal Joint Co., Inc.

Welding Process

29 "How to Weld With Heliarc Torches" contains tips on welding, surfacing, and hard-facing of many metals. The 28-page booklet describes Heliarc equipment and operating techniques Drawings, tables, photos, Linde Air Products Co.

Air Feed Equipment

30 Feedmaster will fit almost every press, spot welder, drill-press, etc., and will automatically feed stock in any thickness from foil to several inches. Three case studies illustrate typical savings. Bulletin includes specifications and photos. Great Western Tools, Inc.

Snap-On Volt Ammeter

31 "How to Make Your Job Easier With the Amprobe" tells all the facts about a pocket-size, snap-on volt ammeter. Cartoons, drawings and photos describe Amprobe's functions. Contains operating instruction and application tips for your electrical maintenance men. Pyramid Instrument Corp.

Centrifugal Pumps

32 Multi-stage, centrifugal pumps designed for high, sustained efficiency at pressures up to 1200 psi. are described in a 16-page bulletin. Thorough coverage—by text, cutaway views, and drawings —of design details. Includes specifications and dimensions. Ingersoll Rand Co.

Pump Drives

33 An 8-page catalog on the Gearturbo pump head describes "the best means of driving a vertical pump with a horizontal driver." Discusses construction features, methods of installation, sizes available, ordering data. Photos, drawings, tables. Peerless Pump Div., Food Machinery & Chemical Corp.

Soldering Equipment

34 A 20-page, pocket-size booklet is packed with soldering do's and don'ts. A simple table helps you pick the right type of flux for any job. Facts about Weller's soldering tools and tips are included. Weller Electric Corp.

Truck-Mounted Crane

35 Wondering how a motorized crane could fit into your operations? Take a look at the 24-page bulletin on Bay City's Cranemobile. It pictures applications by the dozen. There's also a complete analysis of the truck crane's design features. Bay City Shovels, Inc.

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FACTORY MANAGEMENT & MAINTENANCE (January, 1951)
330 West 42nd Street, New York 18

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HOUGHTON'S NEW MULTI-PURPOSE GREASE OFFERS YOU THESE ADVANTAGES:

1. Only one grease to buy, store and apply.
2. High melting point . . . resists elevated temperatures.
3. Pumps readily at below zero temperatures.
4. Water-resistant . . . insoluble in hot or cold water.
5. Stable . . . oxidation-resistant . . . no deterioration in use or in storage.
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7. Non-separating . . . smooth texture.
8. Less chance for error in application.

COSMOLUBE is truly a multi-purpose grease, for use under hot, cold or wet conditions. It combines the advantages of former lime, soda and aluminum base types. It withstands heavy loads. It can be used in automatic lubricators. Yes, for these reasons you who specify and use solid lubricants will welcome this new development from E. F. Houghton & Co., long-time suppliers of "fortified" oils and greases. Plants in Philadelphia, Chicago, Cleveland, Detroit, San Francisco.

See Exhibit
On LUBRICANTS And PACKINGS
Booth 113
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Houghton's Cosmolube

THE PERFECT GREASE...FOR HOT SPOTS...FOR COLD SPOTS...FOR WET SPOTS!

No waste in cutting
skid-resistant

U·S·S MULTIGRIP
FLOOR PLATE

● The symmetrical design of U·S·S Multigrip Floor Plate minimizes waste in cutting, making possible neat installations at minimum cost. And regardless of the way the plate is laid or the angle from which it is approached, Multigrip provides positive skid resistance in all directions . . . it's safe, wet or dry! Multigrip is easy to clean, too. There are no pockets to hold dirt, grease, water . . . drainage is complete and immediate.

Whether used on small step-plates of machinery or to cover entire factory floors, Multigrip installations are neat, comfortable underfoot, economical to maintain, permanent . . . and safe. Get further information about Multigrip from your nearest steel warehouse or write to us direct.

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USS

MULTIGRIP FLOOR PLATE

UNITED STATES STEEL

LIKE AN
ATOM-IC
EXPLOSION

Just ONE 1/32" pin-hole size faucet LEAK
MUSHROOMS into ATOMIC WASTE
of approximately 7,500 gallons
of water yearly COSTING:
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● $1 per M cubic feet

If a hot water faucet, then actual FUEL WASTED heating 76,000 gallons costs approximately:

$27.65 if coal (7,900 lbs.)
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STOP this needless WASTE during today's MATERIAL and MANPOWER shortages with 'SEXAUER' "Easy-Tites" that outwear ordinary faucet washers 6-to-1, thus SAVING labor on 5 REPEAT repairs, PLUS water and fuel, while prolonging the life of SCARCE fixtures.

PAT'D.
"EASY-TITE"
FAUCET WASHERS

...a modern laboratory triumph, are compounded from du PONT NEOPRENE instead of rubber—to withstand DESTRUCTIVE HEAT common in present-day super-heating water systems—that formerly broke down washer's structure (tested to withstand 300°F.).

Built like a tire with fabric re-inforcement they resist the grinding, closing squeeze that SPLIT and MUSH ordinary washers out of shape... causing LEAKS.

Through combining NEOPRENE and FABRIC RE-INFORCEMENT they OUTWEAR ordinary washers 6-to-1 on hot or cold TAPS—thus you slash water fuel and labor costs.

THE NEW 'SEXAUER' CATALOG

Edition F, just out pictures over 2500 TRIPLE-WEAR plumbing REPAIR parts and Pat'd. Precision Tools. It's today's accepted buying guide for discriminating purchasing and maintenance personnel among thousands of top PLANTS, INSTITUTIONS and GOVT. AGENCIES that rely on SEXAUER repair materials. *Send for your copy today!*

Then too, there's a SEXAUER TECHNICIAN within quick call from coast-to-coast, who offers a special SURVEY service that sets up a schedule of the exact replacement parts required for your particular plumbing fixture regardless of make or age and *without obligation.*

A postcard will bring him and your NEW Catalog F promptly.

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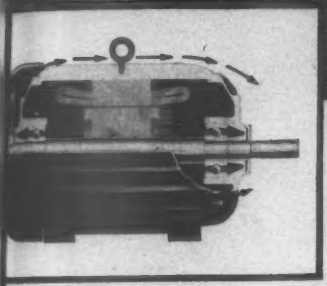
2503-05 Third Avenue, New York 51.

SEXAUER

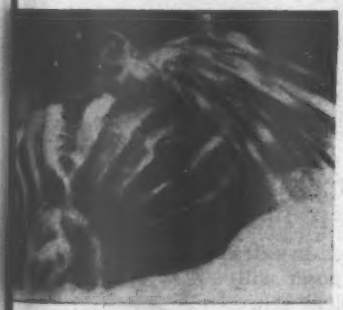
as advertised in THE SATURDAY EVENING POST

CROCKER-WHEELER MOTOR

TOTALLY-ENCLOSED, FAN-COOLED
2 TO 100 HORSEPOWER



rrows show how the slipstream rom the fan continually blows away eat and keeps cooling surfaces free f dirt.



Dust, fumes and moisture can't get nto the C-W Sealedpower motor. his one was run in an atmosphere f fan-driven French chalk, yet not a race was found inside.

The motor that keeps itself cool and clean...

You'll find it profitable to standardize on the Crocker-Wheeler Sealedpower motor for all mill drives in the 2 to 100 hp range. For this motor *assures cooler running with minimum maintenance.*.

This totally-enclosed motor runs cooler—because the distinctive finned housing *adds 150% more cooling surface—and* because the integral fan *continually blows a stream of cooling air* over the entire cooling surface.

On maintenance, you'll save plenty with C-W Sealedpower motors. Sawdust—or any other dust, fumes and moisture—simply can't get inside, while the continual blast of air along the fin surfaces keeps dust off the outside—eliminating a fire hazard.

SEND FOR THIS BULLETIN

It describes all the features that assure you of *top performance with rockbottom operating and maintenance costs* from every C-W Sealedpower motor you install. Write today and ask for Sealedpower Bulletin SL-300-2A. Address your request to *Elliott Company, Dept. F, Jeannette, Pa.*

●

The Elliott C-W Sealedpower motor is available also in explosion-proof construction. Bulletin SL-300-5 covers this type. Copy on request.

Crocker-Wheeler motors range from 1 to 200 hp. Larger Elliott motors and generators are built by the Ridgway Division in Ridgway, Pa.

CW-19

ELLIOTT COMPANY

GENERAL OFFICES & MAIN PLANT—JEANNETTE, PA.

CROCKER-WHEELER DIVISION

Ampere, N. J.

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ELLIOTT *Approved* SERVICE SHOPS COVER THE COUNTRY

ONE SIGNAL or a COMPLETE SYSTEM!

It's the "NAME" THAT ASSURES DEPENDABILITY

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HOLTZER-CABOT

Whether your problem concerns a clock system, intercommunications, fire alarm or a plant paging or signal system, depend on Stanley & Patterson, Faraday, Holtzer-Cabot to give you the best there is. The Faraday UNI-PACT System is particularly important to plants with varying noise levels. 17 quick-change signal units—bells, horns, buzzers, chimes—fit one adapter plate — give you a tailor-made system at all times regardless of noise conditions. Next signal job, consult the nearest Sperti Faraday Branch Office or Representative. They can be helpful in planning the work economically.

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Keeping office and factory workers healthy on the job is particularly difficult in winter months. Sperti Ultra-Violet Sanitizers are world famous for purifying polluted air in stuffy rooms, killing bacteria and reducing the possibility of group infection and the spread of colds and flu. Available in many types of fixtures, some combined with incandescent light. Write for Sperti Ultra-violet catalog.

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BELLS • BUZZERS • HORNS • CHIMES • ULTRA-VIOLET SANITIZERS
VISUAL AND AUDIBLE PAGING DEVICES AND SYSTEMS

How one Pittsburgh Brush*

POLISHES 10,000 HEATING UNITS

** An actual case history from The Edwin L. Wiegand Company, producers of CHROMALOX Heating Units.*

WHEN this company needed a way to take the ragged edges off heating units economically and *fast*, they turned to sturdy, tough Pittsburgh Brushes for the answer. The 6" Pittsburgh steel wire brushes like that shown above polish 10,000 heating units during their life.

LET PITTSBURGH ENGINEERS SOLVE YOUR BRUSH PROBLEMS

Pittsburgh's complete line of brushes of every type, for every purpose, will provide a practical, economical solution of any brush problem you might have. Drop us a line on your company letterhead for a copy of our new booklet that shows, through actual case histories, how Pittsburgh can help cut your brushing operation costs. Address: PITTSBURGH PLATE GLASS COMPANY, *Brush Div.*, Dept. M1, 3221 Frederick Ave., Baltimore 29, Md.

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PPG Power Driven BRUSHES

BRUSHES • PAINT • GLASS • PLASTICS

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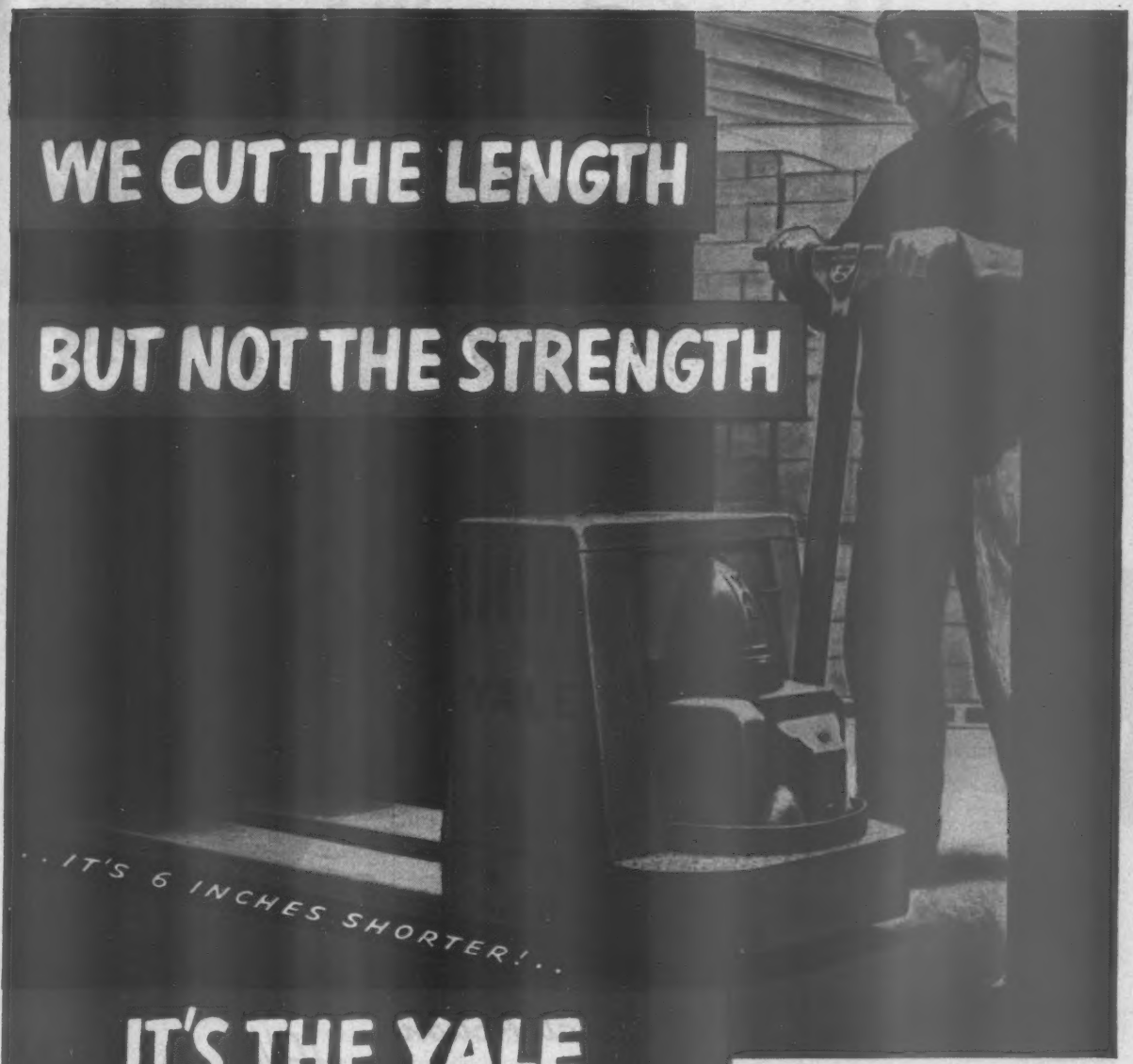

IT'S THE YALE *WORKSAVER* "STUBBY"

RIDE IT OR WALK IT

TRADE YALE MARK

Lifts and carries maximum loads in narrow aisles, boxcars, highway trucks!

Small enough to go where bigger trucks can't—so maneuverable it can turn in its own length—yet strong enough to carry loads of 2,000 to 6,000 lbs! That's YALE'S WORKSAVER—"STUBBY."

It speeds up your materials handling on hard-to-get-at jobs, gives you more storage room because it needs less aisle space.

A powerful electric drive unit and a rugged welded steel frame keep this truck on the job for years with a minimum of "down time." It's remarkably safe and easy to operate, too. Controls for hoisting, positive action safety brakes, and two-speed drive in either direction are all built into the steering handle.

Our representative will be glad to show you how all of these advantages add up to real savings of production time and money for you. *Just send us the coupon today.*

MAIL THIS COUPON NOW

The Yale and Towne Manufacturing Co.
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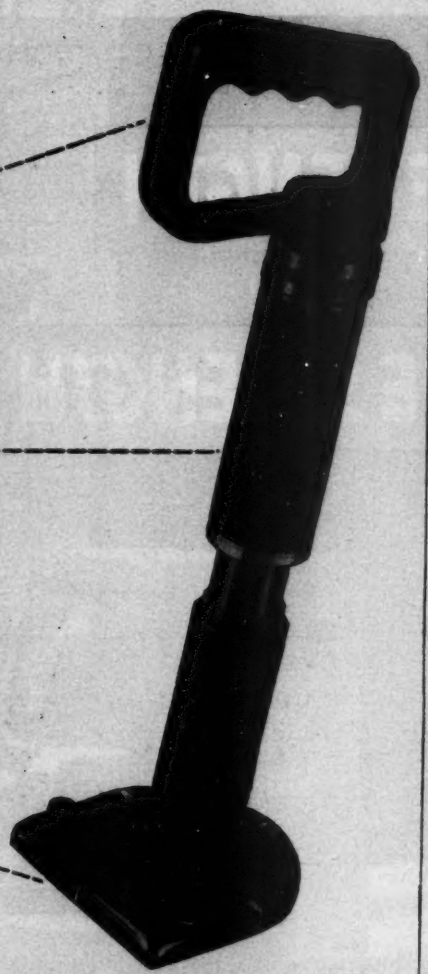
THE YALE & TOWNE MANUFACTURING COMPANY, PHILADELPHIA 15, PA.

2-WAY CHOICE of operating method greatly increases utility of Ramset Dual-Action Tool for instantaneous fastening into steel or concrete — with just a TURN . . or a TAP.

ALL-STEEL CONSTRUCTION, of extra thick, precision machined, aircraft quality steel, adds years of economical, dependable performance.

NEW ROTO-SET SAFETY SHIELD adjusts in ten seconds to any of seven positions; permits easiest, most accurate positioning of fasteners.



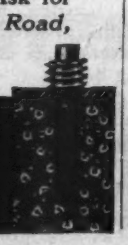
FASTER, EASIER FASTENING

with improved Ramset Dual-Action

You'll be time and money ahead, using RAMSET SYSTEM for fastening work in steel, concrete, masonry. Cutting time by as much as 90%, and costs by as much as 75%, RAMSET pays big dividends to thousands of users. With the improved RAMSET DUAL-ACTION TOOL, benefits are greater than ever before.

Ask for demonstration on your own work

Your local Ramset Specialist will *"Ramset"* a sample job for you, without cost or obligation. He'll show you the wide line of RAMSET FASTENERS, engineered to meet your most exacting needs. He'll prove Ramset's economy, speed and convenience on tough or easy fastening jobs. And, he'll help you find the surest, fastest, lowest-cost methods of doing especially unusual work. Ask for details and proof. *Ramset Fasteners, Inc., 12117 Berea Road, Cleveland 11, Ohio.*

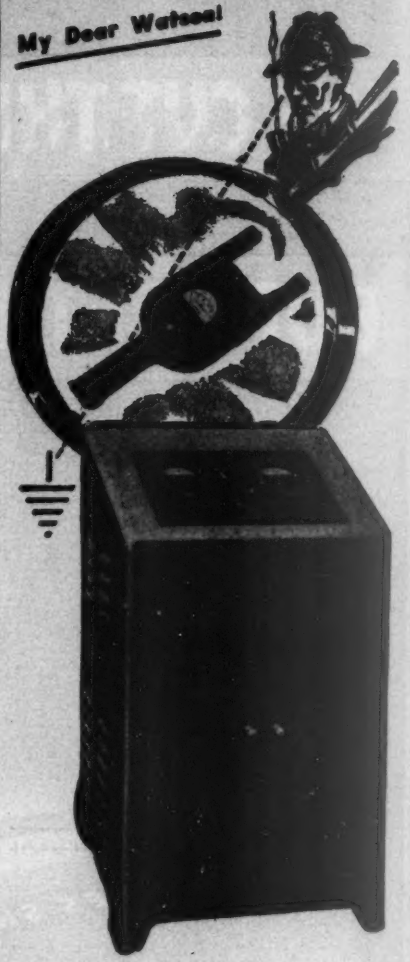


Ramset Fastening System

Pioneer in powder-actuated fastening

FOR SAFETY

My Dear Watson!



the NEW ALLEN ground detector

Quickly detects and locates grounds in all wiring systems and equipment. It is the answer to the urgent and ever-increasing need for safety, *reduction of costs,* of production, operation and maintenance of Industrial Plants.

NO SHUT-DOWNS NECESSARY

IT ELIMINATES:

INTERRUPTION OF PRODUCTION—
SHUTTING DOWN OF POWER—
DAMAGE TO PLANT EQUIPMENT

when used on isolated (ungrounded) power distribution systems.

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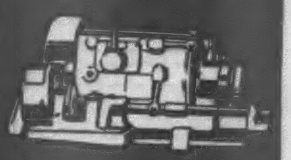

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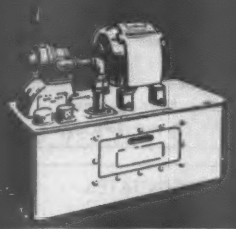

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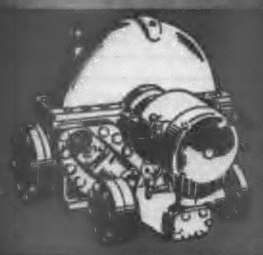

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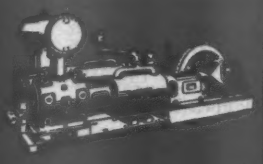
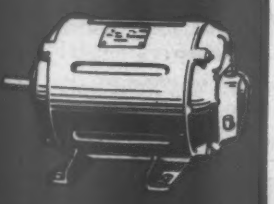


COMPRESSOR



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Now better than ever

NEW

STANOIL
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Industrial Oil

Brings two new benefits to wide range of jobs

For 14 years, STANOIL Industrial Oils have proved their ability to handle a wide variety of jobs in midwest plants. Now, these established products have been made better than ever! They offer these new and important savings in an even wider variety of industrial equipment.

1 LONGER OIL LIFE

Because they have greater oxidation stability, the new STANOILS stand up under high temperatures of operation, maintain low acidity for longer periods of service which helps keep oil systems free from deposits caused by oil oxidation.

2 GREATER PROTECTION against RUST

A corrosion inhibitor of the most advanced type has been added to all grades of the new STANOILS that benefit by such an additive. This inhibitor prevents corrosion trouble by "plating out" on surfaces that tend to rust. In such severe service as paper-machine and steam-turbine lubrication, new STANOILS have put an end to rust and corrosion troubles.

At the left are shown several types of equipment in which the new STANOILS can save you money and maintenance time. A Standard Oil lubrication specialist will help you find still other applications where versatile STANOILS can replace many special-purpose oils. You can reach this man quickly and easily through your local Standard Oil Company (Indiana) office. Contact him today. Or, if you wish, write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA)

STANDARD

Big steel Mill saves:

6 hours of down time plus 12 man-hours on each routine roller-journal overhaul

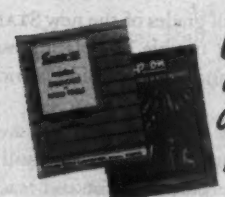
using Snap-on* IMPACT SOCKETS and EXTENSIONS

Saving six hours of production time of a hot-broach unit in one of the largest mid-west steel mills undoubtedly earns enough money to buy many a set of Snap-on Heavy-Duty Impact Sockets!

Add 12 man-hours of skilled maintenance mechanics' time and you've got a savings total to gladden the heart of any cost-worried works manager.

This job demands removal of 16 bolts on each roller. For years it's been a slow, sledge-wrench job, averaging 8 hours apiece for two workers. Today, using a 1½" drive impact gun, with Snap-on Impact Sockets and Extensions, the job is done in 4 hours.

Such savings are frequent among Snap-on users. Snap-on's nation-wide tool service — backed by 30 years' experience in tooling every type of industry for production, assembly and maintenance operations — is your assurance of the best obtainable tools for your needs. Write for catalogs and address of nearest Snap-on branch.



Write for industrial catalog and 104-page general catalog!

*Snap-on is the trademark of Snap-on Tools Corporation.

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FACTORY'S Professional Service Section offers the quickest, most direct method of contacting consultants who may be available . . . now.

Announcing A COMPLETE NEW LINE OF HYDRAULIC PUMPS AND REMOTE CONTROLLED RAMS

SIMPLEX Re-Mo-Trol

with the Famous Simplex "Center-Hole"

GREATER SAFETY
GREATER UTILITY
GREATER CONVENIENCE
...Hundreds of Uses in All Kinds of Industry!

*On rams of 38 tons or greater capacity

LIFT-PUSH-PULL HYDRAULICALLY FROM A DISTANCE

7 Complete Units . . . Broadest Capacity Range in the Field . . . 10 to 100 Tons

Now, meet the "jack-of-all-trades" that is *master* of the world's best known family of industrial jacks! It's an efficiency-family of industrial jacks! It's an efficiency-tool that makes hard lifting – pulling – pushing – bending – straightening – or pressing jobs easier. A tool that assures new safety by remote control and works with full effectiveness where lack of space stymies self-contained jacks or pullers.

Re-Mo-Trol applies oil-smooth hydraulic force in any direction... up, down, sideways, or at any angle. It is light in weight... easily portable... handles unusual jobs with *minimum* need for specialized attachments – thanks to the famous Simplex "Center-Hole."* It is ideal not only for shop use, but for all kinds of applications in the field – in mining, construction... anywhere that heavy loads must be moved or pulled efficiently, safely and at low cost in time and labor.

Get complete information on Re-Mo-Trol from your Simplex Distributor today. Or write direct for Bulletin: Hydraulic No. 50.

Pulling valve seats with Re-Mo-Trol. "Center Hole" provides torque-free pull that takes less effort, is more positive.

RE-Mo-Trol shines in close-quarters pushing like this!

NOTE: In addition to 7 Complete Re-Mo-Trol Units and a broad selection of optional accessories, you can purchase individual Re-Mo-Trol Pumps and Rams separately.

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LEVER • SCREW • HYDRAULIC
Jacks

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REGAN

CASE HISTORY:

REGAN BROS. BAKERY
Minneapolis, Minnesota
J. B. JASSOY, Manager, *reporting:*

The wrapping room floor is subjected to continual foot and truck traffic, yet 10 months after application of Multi-Clean Bakery Floor Preserver, the surface retains its hard, lustrous finish, and maintenance is simple and inexpensive.

Mr. Jassoy's report ten months after the wood floors in this high production bakery were treated with Multi-Clean Bakery Floor Preserver and the Multi-Clean Method gives dramatic proof of results obtained. Multi-Clean Bakery Floor Preserver is specially formulated for wooden floors in the food processing industry; the application is swift and easy; rapid drying makes the floor ready for traffic in 90 minutes after application.

MULTI-CLEAN BAKERY FLOOR PRESERVER'S complete sealing action keeps floors sanitary by closing cracks and crevices against dirt and infestation, resisting growth of mold and other bacteria. On the floor's surface, it has remarkable resistance to fats, oils, water, sugars and alkalies, and provides a hard, lustrous, non-slip finish.

ORDINARY DRY SWEEPING KEEPS FLOORS CLEAN, since spillage of raisins and other sticky products does not adhere to the surface. Weekly damp mopping completes all other cleaning requirements. Occasional steel wooling with a Multi-Clean Floor Machine maintains the floor's lustre. With all these advantages, the cost of Multi-Clean Bakery Floor Preserver per square foot, per coat, is less than one cent a year. Upkeep expense is correspondingly low.

FREE! Send for your copy of the case history complete with cost figures. Also, ask for our free reference manuals on all types of floors.

VISIT OUR BOOTH! We'll see you in booth 752 at the Plant Maintenance Show, Cleveland, Jan. 15-18.

MULTI-CLEAN PRODUCTS, INC.
2277 Ford Parkway, Dept. 34E
St. Paul 1, Minnesota

MULTI-CLEAN
PRODUCTS, INC.

Gentlemen: Send me this case history on Bakery Floor Preserver and also the floor maintenance manuals I have checked.

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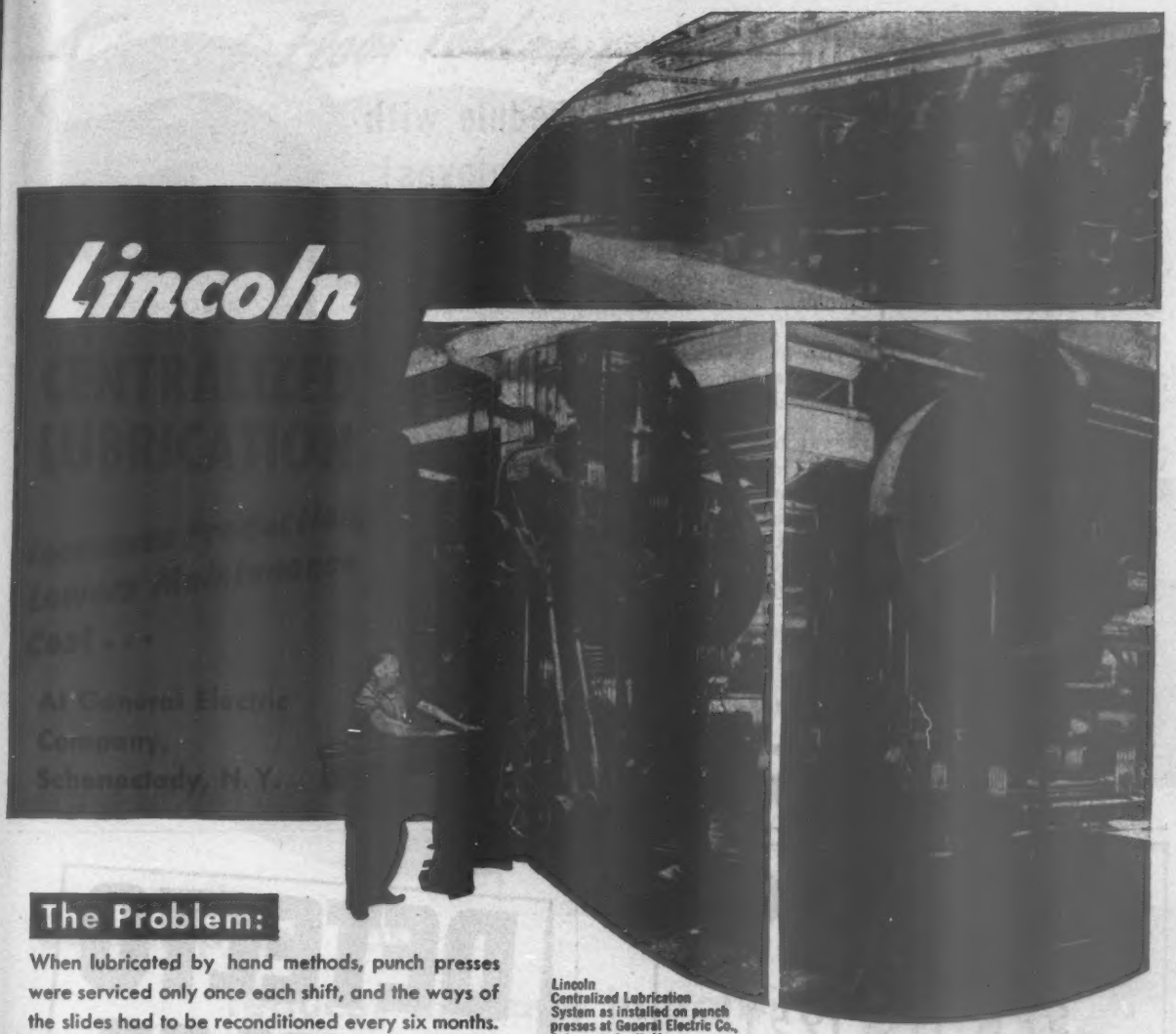

Lincoln Centralized Lubrication System as installed on punch presses at General Electric Co., Schenectady, N. Y.

The Problem:

When lubricated by hand methods, punch presses were serviced only once each shift, and the ways of the slides had to be reconditioned every six months. The once-a-shift lubrication required 18 minutes per press during which time production was at a standstill.

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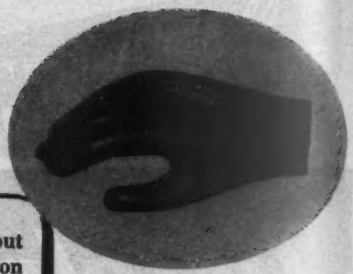

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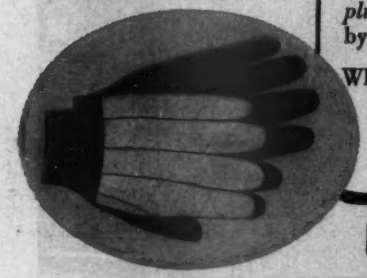

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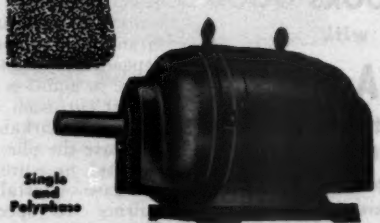

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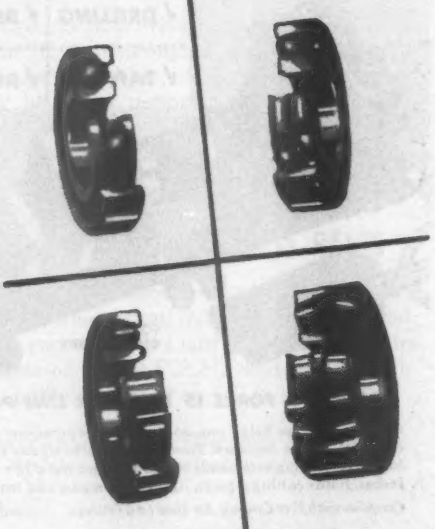

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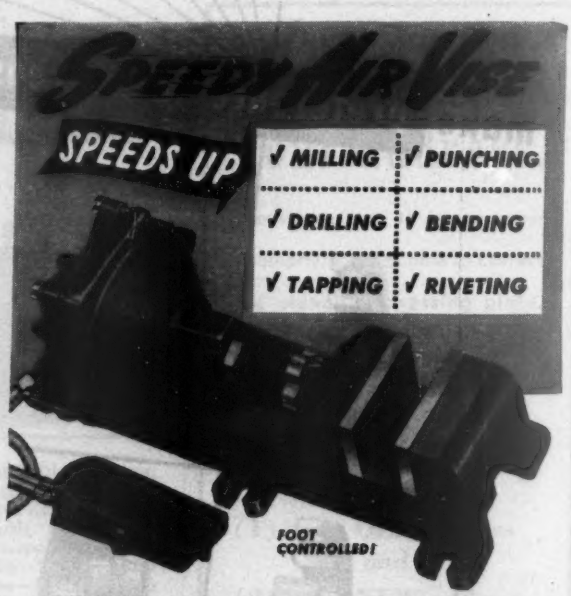

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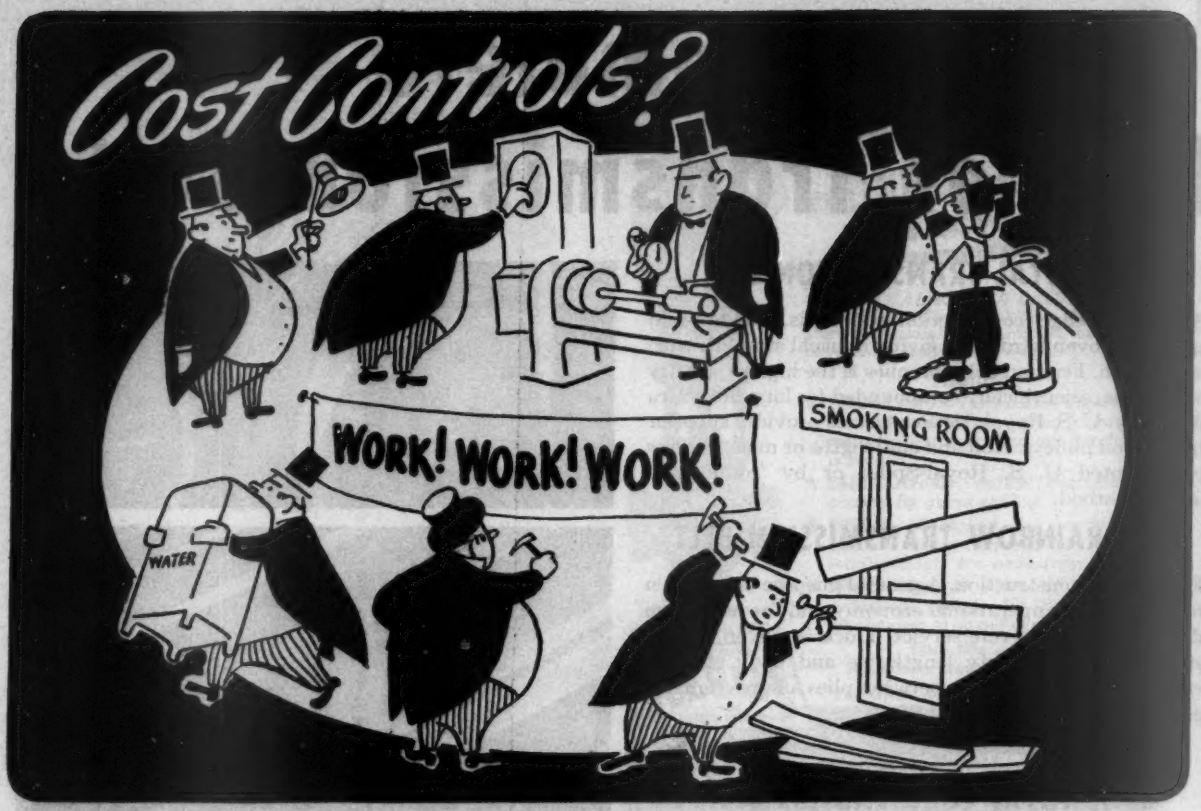

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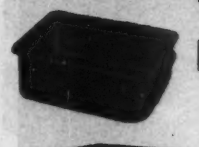

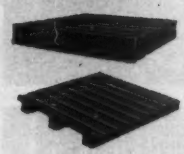

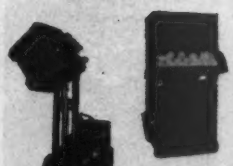

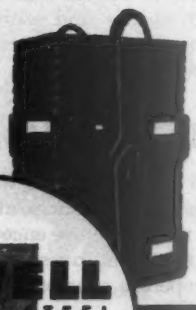

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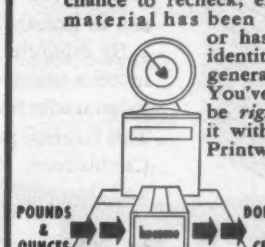
MATERIAL becomes MONEY on your SCALES!

Errors made at the scale stay wrong forever. There is no chance to recheck; either the material has been shipped or has lost its identity in the general stock. You've got to be *right*—weigh it with Toledo Printweigh!



Guard Costs with
TOLEDO
All the Way

Check runaway costs—review your scale situation *now!* Have you up-to-date scales—or inefficient "old-timers"? Have you enough scales to cover all steps in materials handling? Do you need Printweigh to stop losses through human errors? Do you have special problems in weighing, checking, testing, counting, batching or force-measuring . . . there's a modern Toledo to do a better job . . . *speedy, accurate cost control!* Send for weight control bulletin 2020.

Toledo Scale Company, Toledo 1, Ohio
Please send me bulletin 2020 showing modern applications of Weight Control.

Name_____

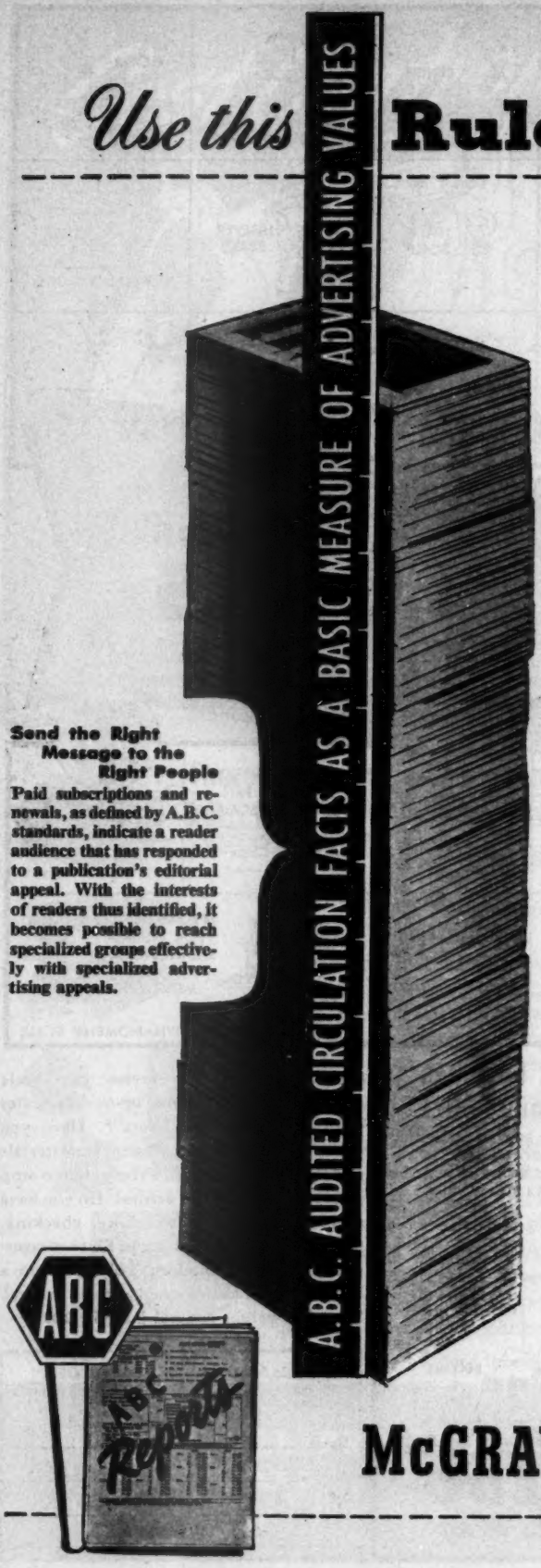
Company_____

Address_____

City_____ State_____

Use this Rule of Facts

for measuring Advertising Values



Send the Right Message to the Right People

Paid subscriptions and renewals, as defined by A.B.C. standards, indicate a reader audience that has responded to a publication's editorial appeal. With the interests of readers thus identified, it becomes possible to reach specialized groups effectively with specialized advertising appeals.

THERE is no substitute for FACTS. That goes for measuring advertising values or making laboratory tests of materials for your factory. When you buy advertising space in a publication you have a cash investment in every copy of the issue that carries your sales message. Obviously some of the people who receive the paper are better prospects for your goods and services than others. Thus the distribution of your advertising, via the publication, becomes a No. 1 factor in the success or failure of your investment. To appraise a publication's advertising value to your business therefore it is necessary to have all the facts about its circulation.

Factual information regarding the identity, quality and size of business paper audiences is available to advertisers in the reports issued by the Audit Bureau of Circulations. The Bureau, a cooperative association of 3300 advertisers, advertising agencies and publishers, has established standards for measuring circulations—maintains a staff of experienced circulation auditors to audit the circulations of publisher members—issues the information thus obtained in A.B.C. reports for space buyers to use in evaluating, comparing and selecting media.

The audited information in A.B.C. business paper reports includes the answers to these questions: **How much paid circulation? How much unpaid? What do subscribers pay? What is their occupation or kind of business? Were premiums used as circulation inducements? How many subscribers renewed? How many are in arrears? Where are the subscribers located?**

By using the audited information in A.B.C. reports in connection with market facts you can accurately judge media for its advertising value to your business. This business paper is a member of the Audit Bureau of Circulations. Ask for a copy of our A.B.C. report and then study it.

McGRAW-HILL publications

Twice the amount of material handled per-day! Wouldn't a report like that sound good to management of *any* company? Lorain Self-Propelled Cranes are saving money, and solving scarce manpower problems, wherever they take over material handling jobs, regardless of size, type or shape. It won't cost a penny to ask your Thew-Lorain Distributor for an analysis of your plant needs . . . it's the first step to lower your material handling costs!

Here are reasons LORAIN Cranes will save . . .

ONE MAN OPERATED

FINGER-TIP AIR-STEERING

ALL CONTROLS IN OPERATOR'S CAB

4 SPEEDS IN BOTH DIRECTIONS (1 to 7 m.p.h.)

ONE ENGINE PROPELS AND POWERS CRANE

4 AND 6 WHEEL CARRIERS

A CHOICE OF LIFTING CAPACITIES UP TO 20-TONS

TRAVEL ANYWHERE —ON RUBBER TIRES

THEW LORAIN

RUBBER-TIRE & CRAWLER CRANES FOR INDUSTRY

**Name of this well-known tire producer furnished on request*

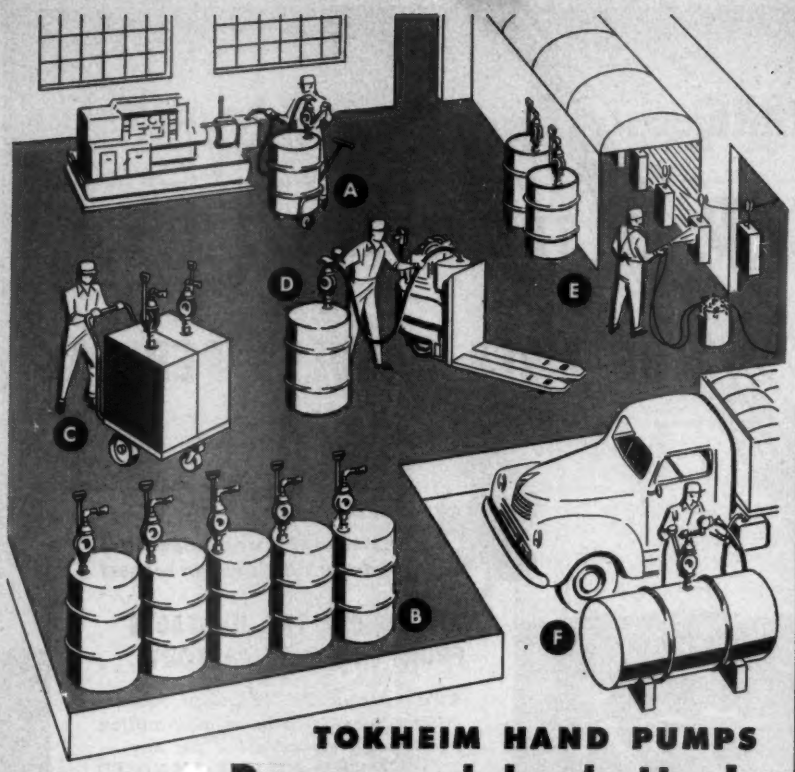
HERE ARE THE JOB FACTS FROM THIS TIRE FACTORY . . .

- *Two Lorain Self-Propelled rubber-tire Cranes handle a half-million pounds of scrap rubber per day — TWICE THE VOLUME HANDLED WITH FORMER EQUIPMENT.*
- *Lorain Cranes are equipped with clamshell bucket — they receive, unload freight cars and trailers and stockpile — pick up about 3000 pounds at a bite.*
- *Long 40-foot booms aid in precise spotting to build and break down stockpiles.*
- *Crane mobility serves all sections of 55 acre yard — to build and remove material from 150 stockpiles located in the yard.*
- *The increased material handled by the Lorain Crane method now makes it possible to balance scrap rubber receivables with reclaiming consumption at the factory.*
- *Manhours previously used in manual handling now channeled to other necessary productive work.*

THE THEW SHOVEL CO., LORAIN, OHIO

WRITE FOR
NEW CATALOG

Ask for your copy of new book —"LORAINS IN INDUSTRY" — 24 pages illustrating latest material handling methods in plants across the nation.



TOKHEIM HAND PUMPS

Do many jobs better!

— speed transfer of oil and other commercial liquids — eliminate slippery floors — reduce fire hazard

With this multi-purpose pump, you now can improve liquid handling *throughout* your plant. Tokheims eliminate wasteful, dangerous dripping, dispense fluid practically free of sediment or condensation, conserve on drum storage space. These low-cost pumps—approved for use where safety measures are important—are easy to operate, have high vacuum efficiency. Self-priming. No wasted motion. Operating with a single diaphragm, a Tokheim pumps on both back and forward strokes. Write factory today for literature; also for detailed information relative to your particular needs.

A. Transfer coolants
B. Oil storage
C. Portable oiler
D. Refueling lift trucks
E. Paint shop
F. Portable fuel storage

QUALITY TOKHEIM HIGH VACUUM HAND PUMP

General Products Division
TOKHEIM OIL TANK AND PUMP COMPANY
1660 Wabash Ave., Fort Wayne 1, Indiana
Factory Branch: 1309 Howard St., San Francisco 3, Calif.

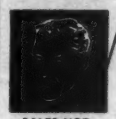
better *inside*

communication for today's increased production

CHIEF ENGINEER

FOREMAN

TRAFFIC MGR.


SALES MGR.

COMPTROLLER

WORKS MGR.

PRODUCTION MGR.

KELLOGG SELECT-O-PHONE
THE *inside* VOICE OF BUSINESS

● The stepped-up tempo of American business demands maximum efficiency *within* every organization. Getting jobs done — getting orders *out*—requires instant interchange of ideas — split-second communication with business associates! SELECT-O-PHONE, the automatic, private inside communication system, is the answer!

With SELECT-O-PHONE you can talk to one or dozens of department heads, individually or collectively, at the flick of a dial! You can use it for conferences and with a paging or locating system.

SELECT-O-PHONE requires no operator! It leaves your switchboard free of *inside* calls—better able to handle those important incoming and outgoing calls so essential to every business. Get the facts.

SEND COUPON NOW!

SELECT-O-PHONE DIVISION, Dept. 12-L
Kellogg Switchboard and Supply Company
6650 S. Cicero Ave., Chicago 38, Ill.

Please rush data explaining how I can save hours and dollars with SELECT-O-PHONE.

NAME_____

COMPANY_____

CITY_____ ZONE____ STATE____

Are 10,000 pumps enough for you?

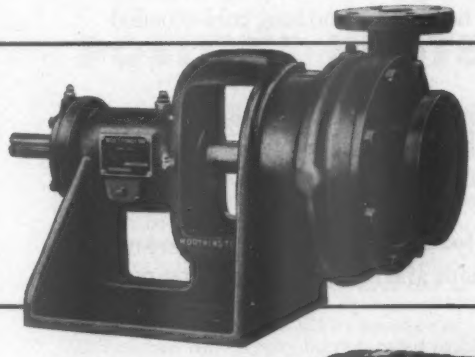
Just about. It takes that many different combinations to make sure that you—big user or small user—get exactly the right pump you need.

That's why we manufacture Worthington centrifugal pumps in over 10,000 standard combinations of capacities, heads, casings and mountings.

Types CN (frame-mounted) and DN (built-in motor) are made in capacities from 10 to 1800 gpm, heads to 535 ft., with 40 sizes of pump casings and 200 combinations of frame-mounted designs.

And—maximum interchangeability of parts!

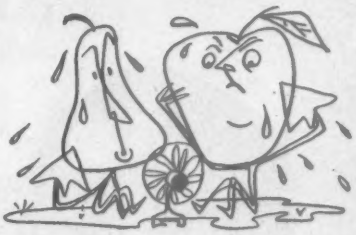
Get the habit of asking for a Worthington—you'll get exactly the pump you want.



Type CN, frame-mounted, is a real "any-drive" pump—readily driven by electric motor, V-belt, or any other source of mechanical power.

Type DN is the famous Worthington Monobloc design—compact, streamlined, with built-in motor. On both types, liquid ends are interchangeable, and can be equipped with either conventional packing or mechanical seal.

The Fruit Was in a Sweat



. . . and So Was the Pump

They suddenly began having a hot time of it at a fruit and produce company near the Dillon Supply Company in Raleigh, N. C.

A centrifugal pump used in their refrigeration system had called it a day, and the temperature was rising in the rooms where the produce was kept. Without refrigeration, the perishables would have indeed perished.

But a frantic call to Dillon located, in the distributor's stock of Worthington centrifugal pumps, exactly the size needed. Prompt delivery . . . and not a lettuce leaf was allowed to wilt.

It's another example of the wisdom of depending on your Worthington Distributor. No distributor offers *more* pumps . . . no distributor offers more *value* in pumps . . . than a Worthington distributor.

WORTHINGTON

THE GOOD RIGHT HAND OF INDUSTRY

POWER TRANSMISSION: sheaves, V-belts, variable speed drives. PUMPS: centrifugal, power, rotary, steam. AIR COMPRESSORS: water-cooled, air-cooled. PC.O.S

Worthington Pump and Machinery Corp.
Pump and Compressor Merchandising Div.
Harrison, N. J.

Send latest bulletin on Worthington Centrifugal Pumps. Any other (type).....

Name.....

Company.....

Address.....

City.....State.....

are businessmen

COLD-BLOODED?

OF COURSE NOT! Literally, their normal body temperature is 98.6—same as laborers, engineers or any other group of people. And, figuratively, they're no more, or no less, cold-blooded—as a group.

We all know unreasonable generalizations can be dangerously false. Common sense and on-the-job experience show us the value of dealing specifically with ideas, problems—and *people.*

Let's not make the big—and costly—mistake, then, of generalizing on religious or racial groups. Adopt and *carry out* these common sense principles:

1. Accept—or reject—people on *their individual worth.*
2. Don't listen to or spread rumors against a race or a religion.
3. Speak up, wherever we are, *against* prejudice. Work for understanding.

A PUBLIC SERVICE PROJECT
THE ADVERTISING COUNCIL

Published in the public interest by:

McGraw-Hill Publications

Automobile parts being protected for export shipment. (Left) Hoods and cowls pass through continuous criss-cross spray of NO-OX-ID before crating. (Right) Small parts are dipped in NO-OX-ID

POSITIVE PROTECTION FOR YOUR PRODUCTS WITH DEARBORN NO-OX-ID

Whether you manufacture products for export or domestic markets —if they are made of metal, they need protection against the costly, constant threat of rust.

Whether your products require a coating that is transparent, heat resisting, cold resisting, lubricating or dry to the touch, there is a correct NO-OX-ID for your use. There is also a method of application suited to your operation. NO-OX-ID may be applied by hot or cold dip—either by hand or conveyor. It may be sprayed or brushed on—it may be protected in NO-OX-IDized wrappers.

NO-OX-ID will also play an important part in protecting the equipment in your plant, your out-buildings, storage tanks, and metal surfaces wherever corrosion threatens. Lower maintenance costs are made possible with NO-OX-ID.

Dearborn has been serving industry since 1887—put these years of experience to work for you, preventing corrosion on your products and in your plant. Consult with a Dearborn Engineer—he will advise you as to which NO-OX-IDs are best suited to your needs.

DEARBORN CHEMICAL COMPANY

***General Offices:* 310 S. Michigan Ave. • Chicago 4, Ill.**

Dearborn

Reg. U. S. Pat. Off.

THE ORIGINAL RUST PREVENTIVE

NO – OX – ID

IRON + OXYGEN RUST

WRITE FOR THIS VALUABLE BOOKLET

A complete introduction to Dearborn NO-OX-IDs with valuable information to help you protect against rust in your plant and on your product. Mail the coupon.

DEARBORN CHEMICAL COMPANY
310 S. Michigan Ave., Dept. F
Chicago 4, Ill.

Gentlemen: Please send me a copy of your booklet on NO-OX-ID Rust Preventives.

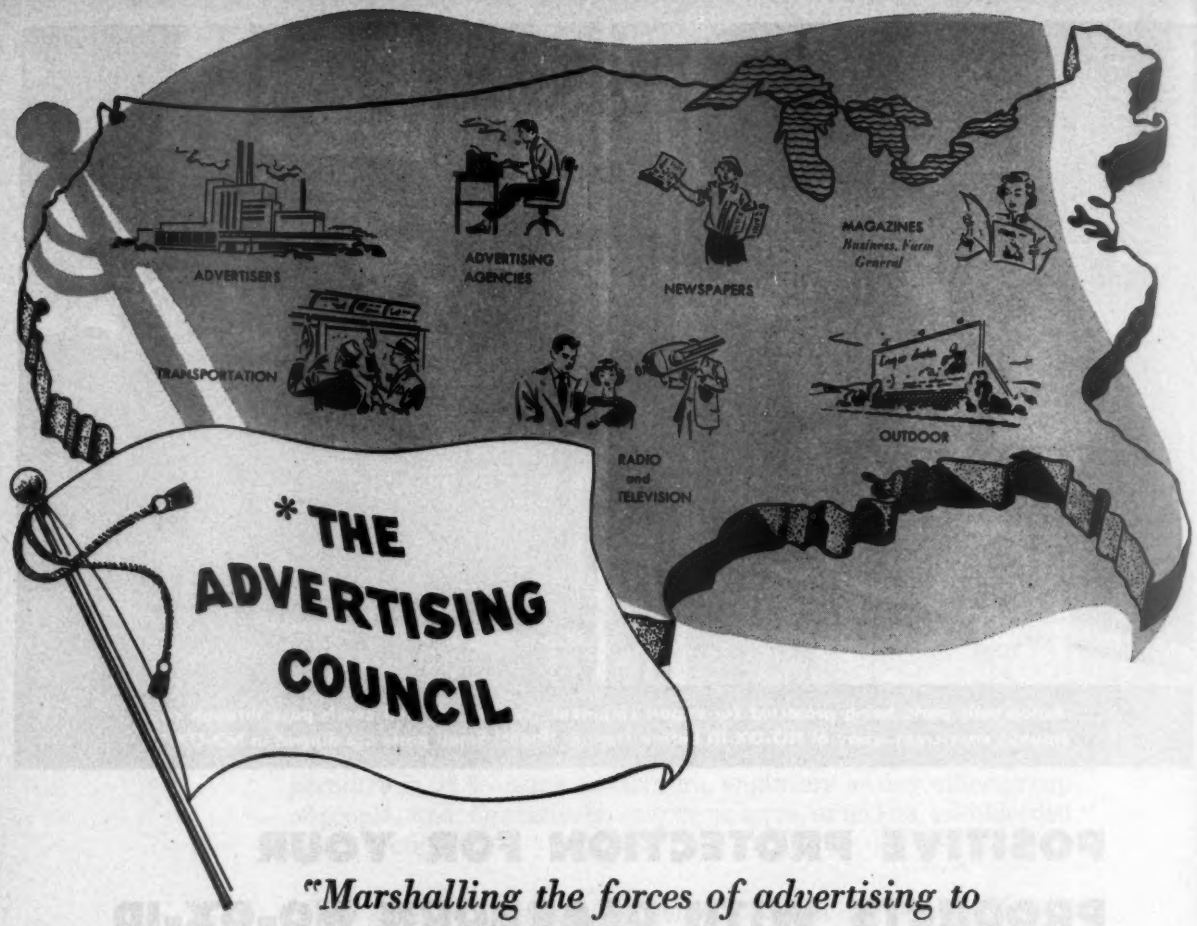
Name.....

Company.....

Title.....

Address.....

City.....*State*.....



"Marshalling the forces of advertising to help solve national problems and to make democracy work better . . ."

DO YOU KNOW that the forces of advertising are engaged today in one of the world's greatest jobs of mass education . . . *in the public interest?*

Do you know that these forces for good have been released through the vision and unselfish cooperation of American business — advertisers, advertising agencies, media owners and others?

Hundreds of advertising agencies have volunteered their planning and creative time and facilities. Artists, cartoonists, photo-engravers, printers, typographers and others have contributed their services.

Media owners have donated millions of dollars in space and time. National and local advertisers have sponsored and paid for many millions of public service advertising messages.

As a result, the American people are being alerted as never before to the dangers which threaten from within and from without . . . the dangers of ignorance about our American economic system, intolerance, tuberculosis, school and teacher shortages, etc.

And, at the hub of this great public service effort is *your* organization . . . The Advertising Council.

Advertisers and Media Owners . . . Your Help is Needed!

Right now The Advertising Council has 14 programs in operation. The success of these programs depends on the public spirited and generous cooperation of advertisers and media owners. *Your* help, in the form of space or time donations, will mean a lot to us. And remember . . . *What helps America helps you!*

Yours for the Asking

Write for a copy of Booklet No. 15. It will give you pertinent information about The Advertising Council . . . how it started . . . what it is . . . what it does . . .Or ask for material on specific campaigns. Address: — The Advertising Council, 25 West 45th Street, New York 19, N. Y.

Published in the public interest by

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How to
- **organize**
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- **and supervise the small plant**

HERE are the best, profit-building ideas of scientific management, made practical especially for the small plant. This authoritative book brings you the advanced management techniques that will help secure a maximum of production at a minimum cost per unit. Treats every significant management topic, from the principles of scientific management to the considerations in financial planning —from the laws to be considered in production, to sales tools, and their use — from obtaining employee morale, to the know-how rules of machine planning.

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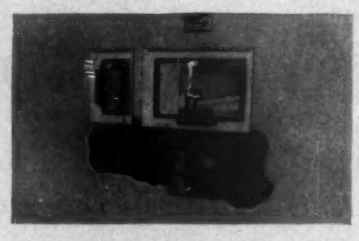
Begins on page 210



Pre-Assembled Pneumatic Tube Station

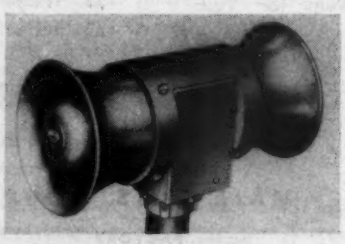
Grover's in-wall pneumatic tube station is completely factory assembled—it comes to the job ready for installation as part of the roughing-in stage when tube runs are made. Installation men won't have to return after finish work is completed in order to make the free-standing type of installation. Wall construction and plaster crews can simply build around the Grover in-wall type. Completed—the job is said to be wall-flush, space saving, quieter, and better looking.

Grover Co., 25523 W. Eight Mile Rd., Detroit 19.

Vitrified Bond Grinding Wheel

The makers of a vitrified bond, the 79E, claim a 5 to 10% increase in grinding wheel life. Their vitrified wheel is recommended for portable grinding of forgings, steel and annealed malleable castings, and stainless steel welds. Bulletin and samples of the 79E wheel may be obtained from manufacturer.

Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago 7.



Dual Speaker

Designed to meet the rigorous requirements of railroad sound systems, this dual speaker is serviceable enough for severe factory and mill operations — yet maintains high sensitivity and intelligibility. The Model RR-40 is weatherproof, immune to acid fumes, and readily

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UNIT TYPE — 300 cfm to 10,000 cfm
LOW COST — ¼ hp to 15 hp.
AVAILABLE FROM STOCK
For: Grinders, buffers, polishers, woodworking, lint . . . ALL DUSTS
Send for Cat. 605f; describe problem.
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- Work 13' Ceilings
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- Wood-Steel Const.

STRADDLES DESKS, MACHINERY, COUNTERS, FURNITURE
$29.50
F.O.B. Spfld. Mass.
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Here are fabricating and assembly facilities to tie in with your production . . . large or small runs. We welcome work as subcontractors. Send parts, blueprints, or write to:

Warren Steel Specialties Corp.
1313 Niles Ave., Warren, Ohio

CORROSION-PROOF PICKLING TANKS

- Corrosion-proof construction of pickling, process storage tanks; industrial floors.
- Experience serving major steel, chemical, textile, food plants.
- Complete Facilities: Design . . . Engineering . . . Materials . . . Construction . . . Maintenance.

Write for bulletin giving full data
101 Chemsteel Building, Walnut Street, Pittsburgh 32, Pa.

CHEMSTEEL CONSTRUCTION COMPANY, INC.
Specialists in Acid-Proof Construction

Production Control Made Easy . . .

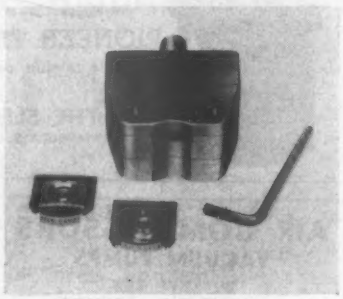
when a Markem machine is on the job. Some Markem machines print directly on parts, others on tags, tickets, or pressure sensitive tapes. All Markem machines are designed for quick type changes, letting you imprint the exact amount of material when and as you need it. All produce crisp, clear imprints. You can avoid printers' bills and bulky inventories, the delays of using transfers or rubber stamps, by adding an economical Markem machine to your production line.

Write: **MARKEM MACHINE CO.**
Keene 33, New Hampshire

serviced by removing two cover plates.

Unit consists of a heavy non-corrosive center aluminum casting with a steel-bell re-entrant speaker at each end of the opening. Mounting flange slip-fits over 2½-in. pipe. Speakers have 40-watt capacity, 350-6000 cycles frequency range, and an 8-ohm input impedance in parallel.

Racon Electric Co., Inc., 52 E. 19 St., New York 3.



Press Holder for Circumferential Marking

Made with shank size to fit any press, the Periphery Press Holder is designed for stamping the outer circumference of small diameter parts. Model PPH-10 is custom-tailored to the job, with radius, size, and number of characters determined by the piece to be marked. A removable plastic side plate holds the regular straight sided type in place.

M. E. Cunningham Co., 180 E. Carson St., Pittsburgh 19.

•

AUTOMATIC COAL SCALE is said to weigh 40 tons per hour to within ½ oz. in 100 lb. Ability of the Richardson K-39 to stay pressure-tight under back pressures up to 60 in. of water means (1) better combustion efficiency by preventing loss of primary air, (2) cleaner boiler rooms, and (3) consistent weighing accuracy. Richardson Scale Co., Clifton, N. J.

► **Case liner adhesives** can be used as seam sealers and closures for waterproof paper bags, wrap, and case liners. They conform to Army and Navy specifications JAN-P-140 in strength, as well as mold, fungi, and water resistance. The Flintkote Co., 30 Rockefeller Plaza, New York 20.

COMPLETE YOUR CRANES WITH **MANSAVER GRABS**
A style for every lifting job. Write for catalog and prices.
MANSAVER INDUSTRIES, INC., 3121 EAST ST., NEW HAVEN, CONN.

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Safety
Security
Identification

Write for free Catalog #FM-51
AWARD INCENTIVES, INC.
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Made for every type of leak — any temperature or pressure. Send for Catalog No. 41-O.
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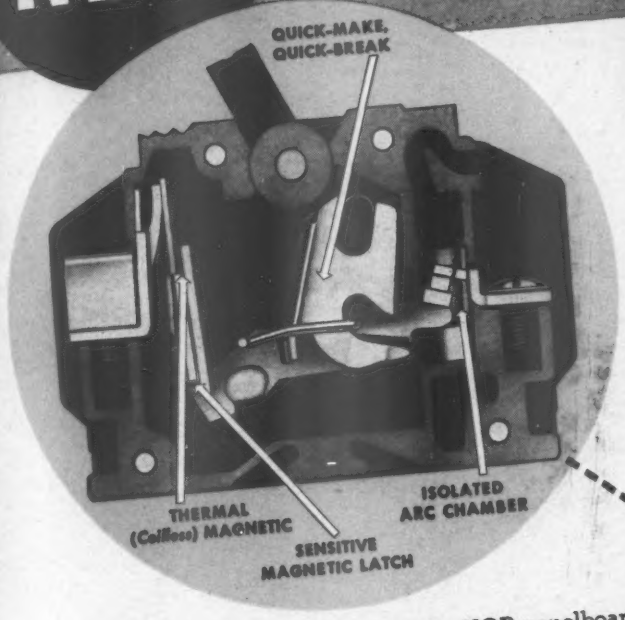

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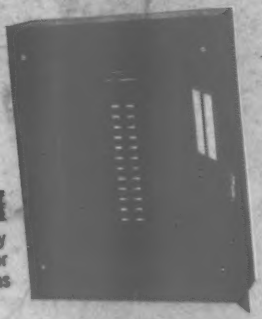

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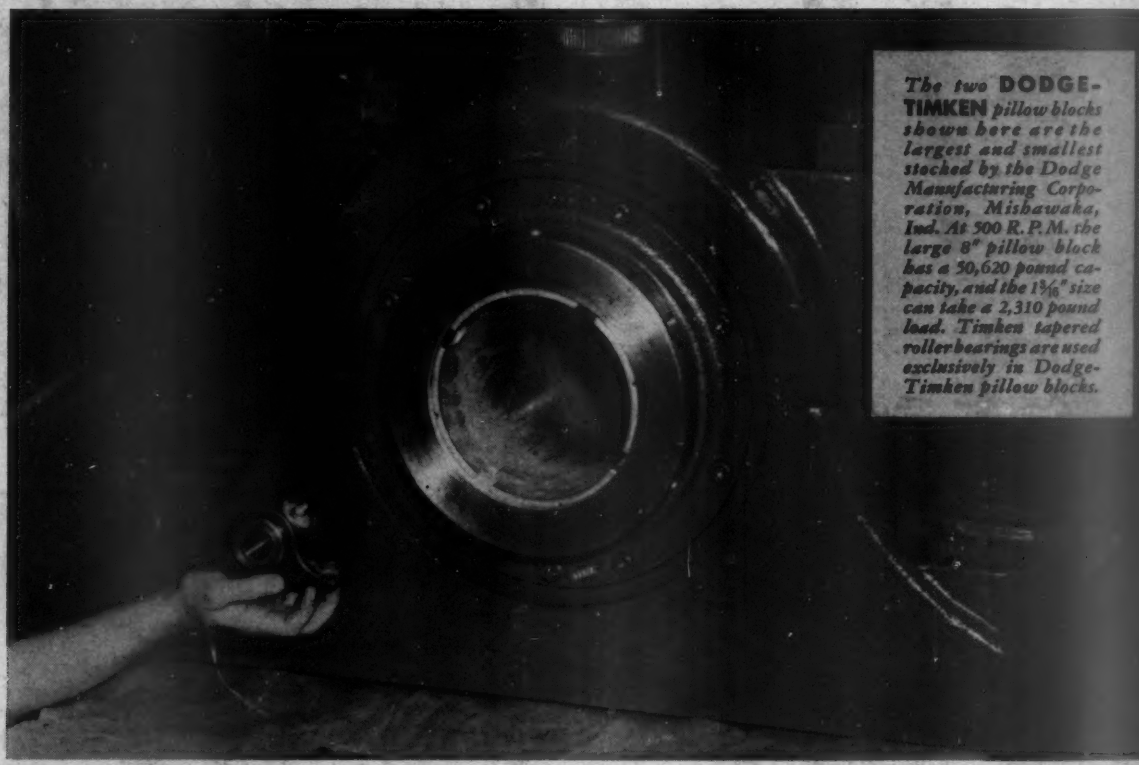

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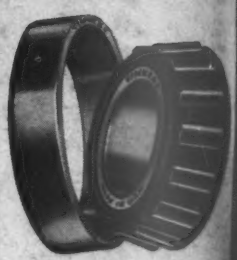

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